MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

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Glossary

Term	Meaning
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Collision risk	Risk of a bird lethally colliding with a wind turbine or associated structure.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Scoping Report	A report setting out the proposed scope of the Environmental Impact Assessment process. The Transmission Assets Scoping Report was submitted to The Planning Inspectorate (on behalf of the Secretary of State) for the Morgan and Morecambe Offshore Windfarms Transmission Assets in October 2022.
Generation Assets	See Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (below).
Interconnector cables	Cables to connect the Offshore Substation Platforms to each other.
Intertidal area	The area between Mean High Water Springs and Mean Low Water Springs.
Long term	Impact timescale of a period of greater than five years.
Maximum design scenario	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Transmission Assets.
Mean High Water Springs	The height of mean high water during spring tides in a year.
Mean Low Water Springs	The height of mean low water during spring tides in a year.
Medium term	Impact timescale of a period of more than one year, up to five years.
Morecambe Offshore Windfarm: Generation Assets	The offshore generation assets and associated activities for the Morecambe Offshore Windfarm.
Morecambe Offshore Windfarm: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morecambe Offshore Windfarm to the National Grid.
Morecambe OWL	Morecambe Offshore Windfarm Limited is a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) and Flotation Energy Ltd.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project
Morgan Offshore Wind Project: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morgan Offshore Wind Project to the National Grid.

Term	Meaning
Morgan OWL	Morgan Offshore Windfarm Limited is a joint venture between bp Alternative Energy investments Ltd. and Energie Baden-Württemberg AG (EnBW).
Offshore booster station	A fixed structure located along the offshore export cables, containing electrical equipment to ensure bulk wind farm capacity can be fully transmitted to the onshore substations.
Offshore export cables	The cables which would bring electricity from the Generation Assets to the landfall.
Offshore Order Limits	See Transmission Assets Order Limits: Offshore (below).
Offshore ornithology	The study of birds that occur offshore i.e., seaward of Mean Low Water Springs (MLWS).
Offshore substation platform(s)	A fixed structure (s) located within the wind farm sites, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Red, Amber and Green List	Lists of conservation concern for birds in the UK (Stanbury *et al.,* 2021)
Scoping Opinion	The report prepared by the Planning Inspectorate on behalf of the Secretary of State containing the written opinion of the Secretary of State as to the scope and level of detail required of the Applicants in their Environmental Statement.
Short term	Impact timescale of any period of time up to one year.
Significant effect	The significance of an effect is a two-stage process determined by the overall sensitivity of the receptor and the magnitude of the effect using a matrix-based approach and applying professional judgement.
Special Protection Area	A protected area for birds, classified in the UK under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 in England and Wales and the UK offshore area. They are classified for rare, threatened and vulnerable birds, as listed on Annex I of the Birds Directive (EU Council Directive 79/409/EEC on the conservation of wild birds), or certain regularly occurring migratory species.
Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.
Transmission Assets	See Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarms: Transmission Assets (above).
Transmission Assets Order Limits	The area within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and/or decommissioning.
Transmission Assets Order Limits: Offshore	The area within which all components of the Transmission Assets seaward of Mean Low Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning. Also referred to in this report as the Offshore Order Limits, for ease of reading.
Zone of Influence	The area in which a receptor may be affected by an impact.

Acronyms

Acronym	Meaning
BoCC	Birds of Conservation Concern
CEA	Cumulative Effects Assessment
CTVs	Crew Transfer Vessels
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EPP	Evidence Plan Process
ES	Environmental Statement
EU	European Union
EWG	Expert Working Group
HRA	Habitats Regulations Assessment
IEMA	Institute for Environmental Management and Assessment
ISAA	Information to Support Appropriate Assessment
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
MDS	Maximum design Scenario
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NE	Natural England
NPS	National Policy Statement
NRW	Natural Resources Wales
OSP	Offshore Substation Platform
PEIR	Preliminary Environmental Information Report
SAC	Special Areas of Conservation
SOV	Service Operation Vessels
SPA	Special Protection Area
SPI	Species of Principal Importance
SSC	Suspended Sediment Concentration
SSSI	Site of Special Scientific Interest

Acronym	Meaning
UK	United Kingdom
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
ZOI	Zone of Influence

Units

Unit	Description
%	Percentage
ha	Hectare
kg	Kilogram
km^2	Square kilometres
m	metres
MW	Megawatt
nm	Nautical mile

5 Offshore Ornithology

5.1 Introduction

5.1.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) work undertaken for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets. For ease of reference the Morgan and Morecambe Offshore Wind Farms: Transmission Assets are referred to in this chapter as the 'Transmission Assets'. This ES accompanies the application to the Planning Inspectorate for development consent for the Transmission Assets.

5.1.1.2 The purpose of the Transmission Assets is to connect the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (referred to collectively as the 'Generation Assets') to the National Grid. A description of the Transmission Assets can be found in Volume 1, Chapter 3: Project description of the ES.

5.1.1.3 This chapter considers the potential impacts and effects of the Transmission Assets on offshore ornithology during the construction, operations and maintenance, and decommissioning phases and identifies any necessary mitigation. Specifically, it relates to the offshore elements (i.e. the offshore export cables) of the Transmission Assets seaward of Mean Low Water Springs (MLWS).

5.1.1.4 This ES chapter:

- identifies the key legislation, policy and guidance relevant to offshore ornithology;
- details the EIA scoping and consultation process undertaken to date for offshore ornithology;
- confirms the study area for the assessment, the methodology used to identify baseline environmental conditions and sets out the existing and future environmental baseline conditions, established from desk studies, surveys and consultation;
- identifies the scope of the assessment;
- details the mitigation and/or monitoring measures that are proposed to prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process;
- defines the project design parameters used to inform for the impact assessment;
- identifies the impact assessment methodology and presents an assessment of the likely impacts and effects in relation to the construction, operation and maintenance and decommissioning phases of the Transmission Assets on offshore ornithology (and, where relevant, the impacts and effects of offshore ornithology on the Transmission Assets); and

- identifies any cumulative, transboundary and/or inter-related effects in relation to the construction, operation and maintenance, and decommissioning phases of the Transmission Assets on offshore ornithology.

5.2 Legislation, policy and guidance

5.2.1 Legislation

Summary

5.2.1.1 In undertaking the assessment, the following relevant legislation has been considered:

- Marine and Coastal Access Act 2009.
- European Union (EU) Council Directive 79/409/EEC on the conservation of wild birds (the 'Birds Directive').
- EU Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').
- The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) which implement the Habitats Directive and the Birds Directive in relation to marine areas where the United Kingdom (UK) has jurisdiction beyond territorial waters (broadly 12 nautical miles to 200 nautical miles).
- The Conservation of Habitats and Species Regulations 2017 (as amended) which implement the Habitats Directive and the Birds Directive in relation to England and Wales as far as the limit of territorial waters (usually 12 nautical miles).
- Wildlife and Countryside Act 1981 (as amended).Natural Environment and Rural Communities Act 2006.Environment Act 2021.

Marine and Coastal Access Act 2009

5.2.1.2 Parts three and four of the Marine and Coastal Access Act 2009 introduced a new marine planning and licensing system for overseeing the marine environment and introduced a requirement to obtain a marine licence for certain activities and works at sea. Section 149A of the Planning Act 2008 allows applicants for development consent to apply for 'deemed marine licences' as part of the consenting process.

Habitats Regulations

5.2.1.3 In England and Wales, the Conservation of Habitats and Species Regulations 2017 (onshore and out to 12nm) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (between 12nm and 200nm), collectively referred to as "the Habitats Regulations", are the principal means by which the Habitats Directive (Council Directive 92/43/EEC) and certain elements of the Wild Birds Directive (Directive 2009/147/EC) are transposed

into UK law. The Habitats Regulations remain in force following the United Kingdom's departure from the EU, subject to certain amendments.

5.2.1.4 The Habitats Regulations require the assessment of significant effects on internationally important nature conservation sites, including:

- Special Areas of Conservation (SACs) or candidate SACs;
- Special Protection Areas (SPAs) or potential SPAs;
- Sites of Community Importance; and
- Ramsar sites (note that these sites are not covered by the Habitats Regulations but are treated as such by governing bodies).

5.2.1.5 These designated sites have been given full consideration in **section 5.6.2** and are given further consideration within the Information to Support Appropriate Assessment (ISAA) part 3 (document reference E2.3).

Wildlife and Countryside Act 1981

5.2.1.6 The Wildlife and Countryside Act 1981 operates in conjunction with the Habitats Regulations and is the principal mechanism for the legislative protection of wildlife in the UK. The Wildlife and Countryside Act 1981 has also been amended following EU withdrawal so that species of wild birds found in or regularly visiting either the UK or the European territory of a Member State will continue to be protected on land and down to MLWS.

Natural Environment and Rural Communities Act 2006

5.2.1.7 The Natural Environment and Rural Communities Act 2006 mandated the list of priority habitats and species that are of principal importance in England and Wales. This list of principally important habitats and species guides decision makers and planning authorities in biodiversity conservation by ensuring that these habitats and species receive appropriate attention and protection.

Environment Act 2021

5.2.1.8 The Environment Act 2021 sets out targets, plans and policies for environmental protection in England. Schedule 15 of the Environment Act 2021 sets out provisions for Biodiversity Net Gain (BNG) in respect of nationally significant infrastructure projects (NSIPs) and amends the Planning Act 2008. These provisions are not yet in force. The provisions include the requirement for the production of BNG statements for applications for development consent under the Planning Act. In response to the recent consultation on the requirements of the Environment Act 2021, the Government has stated that it intends to produce a draft BNG statement and intends to consult with the industry on this (Department for Environment, Food and Rural Affairs (Defra, 2022). The stated intention is for the requirements of the Environment Act 2021, in relation to biodiversity, to be implemented no later than 2025, which will temporally overlap with the ongoing development of the Transmission Assets and will be kept under review.

5.2.2 Planning policy context

5.2.2.1 The Transmission Assets will be located in English offshore waters (beyond 12 nautical miles (nm) from the English coast) and inshore waters (within 12 nm from the English coast), with the onshore infrastructure located wholly within England. As set out in Volume 1, Chapter 1: Introduction, of the ES, the Secretary of State for the Department for Business, Energy and Industrial Strategy (the department which preceded the Department for Energy Security and Net Zero) has directed that the Transmission Assets are to be treated as a development for which development consent is required under the Planning Act 2008, as amended.

National Policy Statements

5.2.2.2 There are currently six energy National Policy Statements (NPSs), three of which contain policy relevant to offshore wind development and the Transmission Assets, specifically:

- overarching NPS for Energy (NPS EN-1) which sets out the UK Government's policy for the delivery of major energy infrastructure (Department for Energy Security & Net Zero 2023a);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (Department for Energy Security & Net Zero 2023b); and
- NPS for Electricity Networks Infrastructure (NPS EN-5) (Department for Energy Security & Net Zero 2023c).

5.2.2.3 **Table 5.1** sets out a summary of the policies within the current NPSs, relevant to offshore ornithology. The assessment presented within this chapter is based on current policy set out within the designated NPSs.

5.2.2.4 The policies within the current NPSs relevant to all topics in the ES can be viewed in the National Policy Statement tracker (document reference J26) and Planning Statement (document reference J28), submitted with the Application.

Table 5.1: Summary of the NPS EN-1, NPS EN-3 and NPS EN-5 policies relevant to this chapter

Summary of NPS provision	How and where considered in the ES
NPS EN-1	
All proposals for projects that are subject to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) must be accompanied by an Environmental Statement (ES) describing the aspects of the environment likely to be significantly affected by the project. (NPS EN-1, paragraph 4.3.1). The Regulations require an assessment of the likely significant effects of the proposed project on the environment, covering the direct effects and any indirect, secondary, cumulative, transboundary, short, medium, and long-term, permanent and temporary, positive and negative effects at all stages of the project, and also of the measures envisaged for avoiding or mitigating significant adverse effects. (NPS EN-1, paragraph 4.3.3).	Assessment of the potential impacts and resultant effects of the Transmission Assets relevant to offshore ornithology is considered in **section 5.11** and **5.13**. The approach to mitigation is discussed in **sections 5.8, 5.11** and **5.13**. Measures adopted as part of the Transmission Assets are presented in **Table 5.15** (see also Volume 1, Annex 5.3: Commitment register of the ES).
For the purposes of this NPS and the technology specific NPSs the ES should cover the environmental, social and economic effects arising from preconstruction, construction, operation and decommissioning of the project. (NPS EN-1 paragraph 4.3.5)	Potential impacts of the construction (including pre-construction), operations and maintenance and decommissioning of the Transmission Assets relevant to offshore ornithology are assessed in **section 5.11**.
The applicant must provide information proportionate to the scale of the project, ensuring the information is sufficient to meet the requirements of the EIA Regulations. (NPS EN-1 paragraph 4.3.10)	Volume 1, Chapter 2, Policy and Legislative Context of the ES (document reference F1.2) sets the legislative context and Volume 1, Chapter 5, Environmental Impact Assessment Methodology of the ES (document reference F1.5) sets out the proportionate approach taken to the assessment. Within the assessments presented in this document sufficient and proportionate information has been provided to inform an adequate assessment. The scale of the project is set out in **section 5.9**.
In some instances, it may not be possible at the time of the application for development consent for all aspects of the proposal to have been settled in precise detail. Where this is the case, the applicant should explain in its application which elements of the proposal have yet to be finalised, and the reasons why this is the case. Where some details are still to be finalised, the ES should, to the best of the applicant's knowledge, assess the likely worst-case environmental, social and economic effects of the proposed development to ensure that the impacts of the project as it may be constructed have been properly assessed. (NPS EN-1 paragraphs 4.3.11 and 4.3.12)	The maximum design scenario (MDS) is shown in **Table 5.16**. The MDS has been selected as those scenarios having the potential to result in the greatest impact on an identified receptor or receptor group, as is according to policy. The assessment of effects is contained in **section 5.11**.

Summary of NPS provision	How and where considered in the ES
The highest level of biodiversity protection is afforded to sites identified through international conventions. The Habitats Regulations set out sites for which an HRA will assess the implications of a plan or project, including Special Areas of Conservation and Special Protection Areas. (NPS EN-1 paragraphs 5.4.4)	Internationally designated sites are identified and described in **section 5.6.2** and, where relevant assessments provided ISAA part 3 (document reference E2.3).
As a matter of policy, the following should be given the same protection as sites covered by the Habitats Regulations and an HRA will also be required: (a) potential Special Protection Areas and possible Special Areas of Conservation; (b) listed or proposed Ramsar sites; and (c) sites identified, or required, as compensatory measures for adverse effects on any of the other sites covered by this paragraph. (NPS EN-1, paragraph 5.4.5).	Internationally designated sites, including potential SPAs, are identified and described in **section 5.6.2** The findings of the Habitats Regulations Assessment (HRA) process are reported in an ISAA part 3 (document reference E2.3), which assesses the impact specifically on all European sites and is submitted alongside the ES.
Many SSSIs are also designated as sites of international importance and will be protected accordingly. Those that are not, or those features of SSSIs not covered by an international designation, should be given a high degree of protection. Most National Nature Reserves are notified as SSSIs. (NPS EN-1 paragraph, 5.4.7).	All relevant Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs) are identified in **section 5.6.2**. The assessment of impacts takes account of all impacts on all designated sites (including SSSIs) within the study areas as defined in **section 5.4** where necessary.
Many individual species receive statutory protection under a range of legislative provisions. Other species and habitats have been identified as being of principal importance for the conservation of biodiversity in England and Wales, as well as for their continued benefit for climate mitigation and adaptation and thereby requiring conservation action. (NPS EN-1 paragraph, 5.4.16).	The assessments presented in this chapter of the ES have followed relevant legislation and guidance as identified in Volume 1, Chapter 2: Policy and legislative context of the ES, Volume 4, Chapter 3: Inter-relationships of the ES with regard to inter-dependencies and ecosystem impacts and **section 5.2** of this chapter. Consideration of statutory protections is provided in **section 5.6** of this chapter, informing the identification of key offshore ornithological receptors of relevance to impacts associated with the Transmission Assets.
Where the development is subject to EIA, the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance (including those outside England), on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity, including irreplaceable habitats. (NPS EN-1 paragraph, 5.4.17).	The baseline ornithological environment is described in **section 5.6**. As part of this chapter, the process of identifying designated sites has been undertaken and results are presented in **section 5.6.2**. The specific bird species that may be affected by the potential impacts of the Transmission Assets are identified in **Table 5.10** and an assessment of the potential effects for these specific species are identified and considered in **section 5.11**.

Summary of NPS provision	How and where considered in the ES
The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests. (NPS EN-1 paragraph 5.4.19)	The Transmission Assets will aim to conserve habitats through a number of measures adopted to reduce the potential impacts of the Transmission Assets including measures to preserve ecologically important features as well as broader measures such as the development of an Offshore Environmental Management Plan (EMP) (see **section 5.8** and Volume 1, Annex 5.3: Commitments register of the ES). These measures have been put in place to take advantage of opportunities to conserve ecological features of conservation interest. The Applicant's approach to biodiversity enhancement is presented in the Outline Onshore Biodiversity Benefit Statement (document reference J11) and Outline Marine Enhancement Statement (document reference J12).
Applicants should include appropriate avoidance, mitigation, compensation and enhancement measures as an integral part of the proposed development. In particular, the applicant should demonstrate that: • during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works • the timing of construction has been planned to avoid or limit disturbance • during construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements • habitats will, where practicable, be restored after construction works have finished • opportunities will be taken to enhance existing habitats rather than replace them, and where practicable, create new habitats of value within the site landscaping proposals. Where habitat creation is required as mitigation, compensation, or enhancement, the location and quality will be of key importance. In this regard habitat creation should be focused on areas where the most ecological and ecosystems benefits can be realised. • mitigations required as a result of legal protection of habitats or species will be complied with. (NPS EN-1 paragraph 5.4.35)	The approach taken to mitigation is described in **section 5.8** and follows the mitigation hierarchy defined. Such measures are also identified within Volume 1, Annex 5.3: Commitments register of the ES. The measures relevant to this chapter are summarised in **Table 5.15** (CoT65 and CoT111 address vessel disturbance).The Applicant's approach to biodiversity enhancement is presented in the Outline Onshore Biodiversity Benefit Statement (document reference J11) and Outline Marine Enhancement Statement (document reference J12).

Summary of NPS provision	How and where considered in the ES
In taking decisions, the Secretary of State should ensure that appropriate weight is attached to designated sites of international, national, and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment. (NPS EN-1 paragraph 5.4.48)	Species of principal importance are considered in determining the conservation value of receptors as part of this assessment, as outlined in **section 5.6.5.** These designated sites are considered in determining the conservation value of receptors as part of this assessment, outlined in **section 5.6.5**.
The Secretary of State should refuse consent where harm to a protected species and relevant habitat would result, unless there is an overriding public interest and the other relevant legal tests are met. In this context the Secretary of State should give substantial weight to any such harm to the detriment of biodiversity features of national or regional importance or the climate resilience and the capacity of habitats to store carbon, which they consider may result from a proposed development. (NPS EN-1 paragraph, 5.4.55)	Consideration of potential impacts on protected species and habitats relevant to ornithological interests is provided in Information to Support Appropriate Assessment part 3 (document reference E2.3). The assessments presented do not conclude significant effects on any species or habitat.
NPS EN-3	
Applicants should discuss the scope, effort and methods required for ornithological surveys with the relevant statutory advisor, taking into consideration baseline and monitoring data from operational windfarms. (NPS EN-3 paragraph 2.8.143)	Details of the proposed approach to baseline characterisation was presented in the Scoping Report and discussed with relevant stakeholders as part of Expert Working Group meetings for the Transmission Assets as detailed in **section 5.3**.
Applicants should consult at an early stage of pre-application with relevant statutory consultees and energy not-for profit organisations/non governmental organisations as appropriate, on the assessment methodologies, baseline data collection, and potential avoidance, mitigation and compensation options which should be undertaken. (NPS EN-3 paragraph 2.8.104)	Throughout the Transmission Assets consultations with relevant statutory and non-statutory stakeholders have been carried out (e.g. via the Evidence Plan process EWG) and are presented in **section 5.3**. All consultation responses provided and changes suggested by the stakeholders are presented in the Consultation report (document reference E1).

Summary of NPS provision	How and where considered in the ES
Offshore wind farms have the potential to impact on birds through: • collisions with rotating blades; • direct habitat loss; • disturbance from construction activities such as the movement of construction/decommissioning/maintenance vessels and piling; • displacement during the operational phase, resulting in loss of foraging/roosting area; • impacts on bird flight lines (i.e. barrier effect) and associated increased energy use by birds for commuting flights between roosting and foraging areas; • impacts upon prey species and prey habitat; and • impacts on protected sites. (NPS EN-3 paragraph 2.8.136)	Assessment of the relevant potential impacts of the Transmission Assets relevant to offshore ornithology are discussed in **section 5.11**.
The Secretary of State should consider the effects of a proposed development on marine ecology and biodiversity, considering all relevant information made available by the applicant. (NPS EN-3 paragraph 2.8.302)	**Section 5.11** presents the assessment of effects of the Transmission Assets on offshore ornithology receptors.
NPS EN-5	
Accordingly, the government envisages that, wherever reasonably possible, applications for new generating stations and their related infrastructure should be contained in a single application to the Secretary of State. However, a consolidated approach of this kind may not always be possible, nor represent the most efficient strategy for delivery of new infrastructure. This could be, for example, due to the differing lengths of time needed to prepare the applications for submission to the Secretary of State, or because a network application relates to multiple generation projects (which could be onshore or offshore), or because the works involved are strategic reinforcements required for a number of reasons. (NPS EN-5 paragraphs 2.7.2 and 2.7.3)	As set out in **section 5.13**, the ES considers the Transmission Assets for Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets. Consideration of . The Holistic Network Design process and the details of the application is set out in Volume 1, Chapter 1: Introduction of the ES.

Summary of NPS provision	How and where considered in the ES
The Applicant will need to consider whether the proposed line will cause such problems (*refers to potential risk to birdlife*) at any point along its length and take this into consideration in the preparation of the ES. Particular consideration should be given to feeding and hunting grounds, migration corridors and breeding grounds, where they are functionally linked to sites designated or allocated under the 'national site network' provisions of the Conservation of Habitats and Species Regulations. (NPS EN-5 paragraph 2.9.5 and 2.9.6)	Designated sites and functionally linked areas are considered in determining the conservation value of relevant ornithological receptors as part of this assessment, outlined in **section 5.6.2**. Assessment of the relevant potential impacts of the Transmission Assets relevant to offshore ornithology are discussed in **section 5.11**.

Marine policy

North West Inshore and North West Offshore Coast Marine Plans 2021

5.2.2.5 **Table 5.2** sets out a summary of the specific policies set out in the North West Inshore and North West Offshore Marine Plans (HM Government, 2021) relevant to this chapter. A National Policy Statement Tracker (document reference J26) and Planning Statement (document reference J28) has been submitted alongside the application which collates compliance with relevant marine plans.

Table 5.2: Summary of inshore and offshore marine plan policies relevant to this chapter

Policy	Key provisions	How and where considered in the ES
NW-DIST-1	Proposals that may have significant adverse impacts on highly mobile species through disturbance or displacement must demonstrate that they will, in order of preference: a) avoid b) minimise c) mitigate - adverse impacts so they are no longer significant	As part of this chapter, designated sites with mobile features connected to the Transmission Assets have been identified (see **section 5.6.2**.). Assessment of the potential adverse impacts and resultant effects of the Transmission Assets relevant to offshore ornithology is considered in **section 5.11** and **5.13**. The approach to mitigation is discussed in **sections 5.8, 5.11**, and **5.13** (see also Volume 1, Annex 5.3: Commitments register of the ES). .
NW-UWN-2	Proposals that result in the generation of impulsive or non-impulsive noise must demonstrate that they will, in order of preference: a) avoid b) minimise c) mitigate	

Policy	Key provisions	How and where considered in the ES
	- adverse impacts on highly mobile species so they are no longer significant	
NW-CBC-1	Proposals must consider cross-border impacts throughout the lifetime of the proposed activity. Proposals that impact upon one or more marine plan areas or terrestrial environments must show evidence of the relevant public authorities (including other countries) being consulted and responses considered.	A screening of transboundary impacts has been carried out and is provided in **section 5.13.5**. It is concluded that there is no potential for significant transboundary effects with regard to offshore ornithology from the Transmission Assets upon the interests of other states.
NW-MPA-1	Proposals that support the objectives of marine protected areas and the ecological coherence of the marine protected area network will be supported.	As part of this chapter, designated sites with mobile features connected to the Transmission Assets have been identified (**section 5.6.2**). This is to ensure that all features and species of conservation importance were considered, where relevant, in this assessment. The HRA Stage 1 Screening Report for the Transmission Assets (document reference E3) considers the potential direct or indirect impacts of features of relevant SPA sites and where relevant will be included in the Information to Support Appropriate Assessment (document reference E2.1).
NW-BIO-1	NW-BIO-1 encourages and supports proposals that enhance the distribution of priority habitats and priority species.	The Transmission Assets will aim to conserve habitats and species as far as reasonably practicable through a number of measures adopted to reduce the impact of the Transmission Assets (**section 5.8**).
NW-BIO-2	NW-BIO-2 requires proposals to manage negative effects which may significantly adversely impact the functioning of healthy, resilient and adaptable marine ecosystems.	In addition to measures adopted as part of the Transmission Assets and sensitive project design, secondary mitigation is considered where an impact is considered to be significant in EIA terms. This assessment is undertaken for each impact (**section 5.11** and **5.13**).
NW-BIO-3	NW-BIO-3 encourages and supports proposals that deliver biodiversity gain by conserving, enhancing or restoring coastal habitats.	The Applicant's approach to biodiversity enhancement is presented in the Outline Onshore Biodiversity Benefit Statement (document reference J11) and Outline Marine Enhancement Statement (document reference J12).
NW-CE-1	Proposals which may have adverse cumulative effects with other existing, authorised, or reasonably foreseeable proposals must demonstrate that they will, in order of preference: a) avoid b) minimise c) mitigate	Cumulative effects have been quantified and their significance assessed in **section 5.11.5** and **5.13**. The approach to mitigation for cumulative effects is discussed in **section 5.13**.

Policy	Key provisions	How and where considered in the ES
	- adverse cumulative and/or in combination effects so they are no longer significant. Proposals which may have adverse cumulative effects with other existing, authorised, or reasonably foreseeable proposals must demonstrate that they will avoid, minimise and mitigate.	

5.2.3 Relevant guidance

5.2.3.1 The offshore ornithology impact assessment has followed the methodology set out in Volume 1, Chapter 5: Environmental assessment methodology of the ES. Specific to the offshore ornithology impact assessment, the following guidance documents have also been considered.

- Guidelines for ecological impact assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. September 2018 Version 1.1 - updated September 2019 (CIEEM, 2019).
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind applications (Natural England (NE), 2022a).
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase II: Expectations for pre-application engagement and best practice guidance for the Evidence Plan process (Natural England, 2022b).
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase III: Expectations for data analysis and presentation at examination for offshore wind applications (Natural England, 2022c).
- Environmental Impact Assessment for Offshore Renewable Energy projects (British Standards Institute, 2015).
- UK Planning Inspectorate Advice Note Twelve: Transboundary Impacts (PINS, 2015); and Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2019).

5.3 Consultation

5.3.1 Scoping

5.3.1.1 On 28 October 2022, the Applicants submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operations and maintenance, and decommissioning phases of the Transmission Assets.

5.3.1.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion in December 2022. Consultation responses received as part of the Scoping Opinion and how they are addressed within the assessments conducted for offshore ornithology are provided in **Table 5.3**.

5.3.2 Evidence plan process

5.3.2.1 Following scoping, consultation and engagement with interested parties specific to offshore ornithology has continued. An Evidence Plan Process (EPP) has been developed for the Transmission Assets, seeking to ensure engagement with the relevant aspects of the EIA process throughout the pre-application phase. The development and monitoring of the Evidence Plan and its subsequent progress has been undertaken by the EPP Steering Group. The Steering Group comprises the Planning Inspectorate, the Applicants, the Marine Management Organisation, Natural England, Historic England, the Environment Agency and the Local Planning Authorities as the key regulatory bodies.

5.3.2.2 As part of the EPP, EWGs were set up to discuss and agree topic specific matters with the relevant stakeholders.

5.3.2.3 This has included consultation through the EWG for offshore ornithology comprising representatives from the Transmission Assets, the Royal Society for the Protection of Birds, the Marine Management Organisation, The Wildlife Trusts and Natural England. Of relevance to offshore ornithology, the first meeting of the EWG provided attendees with an overview of the baseline data available, including supporting surveys where available, the approach to assessment, including impacts scoped into and out of the assessment, the assessment methodology and a summary of the HRA screening process.

5.3.2.4 Discussions held during offshore ornithology EWG meetings and how they have been considered within the assessments conducted for offshore ornithology are provided in **Table 5.3**.

5.3.3 Statutory consultation responses

5.3.3.1 The preliminary findings of the EIA process were published in the PEIR in October 2023. The PEIR was prepared to provide the basis for formal consultation under the Planning Act 2008. This included consultation with statutory and non-statutory bodies under section 42 and 47 of the Planning Act 2008.

5.3.3.2 Consultation responses received as part of the section 42 and 47 process and how they are addressed within the assessments conducted for offshore ornithology are provided in **Table 5.3**.

5.3.4 Summary of consultation responses received

5.3.4.1 A summary of the key items raised specific to offshore ornithology is presented in **Table 5.3**, together with how these matters have been considered in the production this chapter. It should however be noted that

formal responses are provided for all consultation responses received and can be accessed in the Consultation Report (document reference E1).

Table 5.3: Summary of key consultation comments raised during consultation activities undertaken for the Transmission Assets relevant to offshore ornithology

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
December 2022	**Scoping Opinion** Planning Inspectorate	The Scoping Report proposes to scope in indirect impacts from underwater sound affecting prey species during construction and decommissioning and scope out this impact during operation on the basis that the underwater sound emitted during the operations and maintenance phase would not cause significant disruption to prey species. Prey species may be affected by several sources of impact in addition to sound (e.g., habitat loss and increased Suspended Sediment Concentrations (SSCs) and associated sediment deposition) as described in (and scoped in to) Section 4.1: Benthic subtidal and intertidal ecology and Section 4.2 Fish and shellfish ecology. The Inspectorate considers therefore that the scope of this matter should be broadened to consider indirect impacts to ornithology receptors due to changes in prey availability arising from all significant sources, and that this should be considered for all phases of the development where significant changes to prey availability are likely to occur. The Scoping Report proposes to scope in indirect impacts from underwater sound affecting prey species during construction and decommissioning and scope out this impact during operation on the basis that the underwater sound emitted during the operations and maintenance phase would not cause significant disruption to prey species.	Assessment of all factors affecting prey species for birds is provided in **Section 5.11.3**. This is considered to cover all factors, including habitat loss and increased SSCs for all phases of the Transmission Assets.
December 2022	**Scoping Opinion** Planning Inspectorate	The Inspectorate acknowledges that significant collision risk to birds arising from the stationary Offshore Substation Platforms (OSPs) and Morgan offshore booster station structures is considered to be unlikely and is therefore content to scope this matter out.	The stationary Offshore Substation Platforms (OSPs) and Morgan offshore booster station structures have been removed from the project design since submission of the PEIR.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
December 2022	**Scoping Opinion** Planning Inspectorate	The Scoping Report proposes to scope this matter [barrier effects] out as the relatively small scale of the stationary OSPs and Morgan offshore booster station structures means that they are unlikely to present a significant barrier to the movement of birds. The Inspectorate considers that the collective impact of the turbines and the proposed offshore platforms should be considered and therefore does not agree to scope this matter out of the operational phase.	There would be no barrier effect as a result of the Transmission Assets due to the lack of physical structures above water which may prevent movement, so no cumulative assessment has been undertaken. The baseline data and the assessment process was discussed and agreed in an EWG meeting on the 1 June 2023 (see below). This is consistent with assessments undertaken for other similar transmission assets consent applications (e.g., the Triton Knoll Electrical System (RWE, 2015)).
December 2022	**Scoping Opinion** Planning Inspectorate	As per Table 2.2, comment 2.2.3 of this Opinion, the Inspectorate agrees to scope this out. [In relation to accidental pollution effects across all project phases]	Scoped out as per **paragraph 5.7.1.3.**
December 2022	**Scoping Opinion** Planning Inspectorate	The Scoping Report proposes to characterise the baseline using offshore ornithological surveys undertaken within the Morgan and Morecambe OWF array study areas, as well as intertidal and nearshore waterbird surveys, filling in the gaps with data derived from existing seabird datasets. The Inspectorate advises that the Applicants should seek to agree the survey coverage, modelling parameters used, and the methodology applied with the relevant consultees through the Evidence Plan process to ensure that it is sufficient to cover the transmission infrastructure.	Throughout the Transmission Assets, consultations with relevant statutory and non-statutory stakeholders have been carried out (e.g., via the Evidence Plan Process EWG) and are presented in **section 5.3**. This has included consultation on the baseline environment. The surveys conducted have followed standard industry practice. Natural England have provided the Applicants with additional data to inform characterisation of the baseline environment. The Applicants have also incorporated further data from the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets into the ES. The approach to baseline characterisation is consistent to the approach taken for other similar transmission assets consent applications (such as Triton Knoll electrical System) and for applications

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			incorporating both generation and transmission components of offshore wind farm developments (such as Awel y Môr Offshore Wind Farm).
December 2022	**Scoping Opinion** Planning Inspectorate	The Scoping Report does not provide any detail on the specific measures to be included within these plans, noting they may evolve as the EIA progresses. Where these measures are being relied upon for the assessments in the ES they must be set out in the ES in detail, including how they are to be secured e.g., by the Development Consent Order (DCO) requirement.	Measures adopted as part of the Transmission Assets and relevant to offshore ornithology are provided in **section 5.8** (see also Volume 1, Annex 5.3: Commitments register of the ES). This includes an EMP (CoT65), which incorporates marine pollution control measures and a VTMP (CoT69 and associated measures (CoT110 and CoT111)) which will be secured within the requirements of the DCO.
December 2022	**Scoping Opinion** Isle of Man Government	Manx shearwater, guillemot, razorbill and kittiwake are noted as numerous in previous surveys of development assets study area. These are all within foraging range of their Isle of Man breeding colonies. Recent Birdlife data show that populations on the Isle of Man exceed 1% of the UK or British Isles breeding seabird populations for herring gull, little tern, shag and cormorant and for wintering populations of shag, herring gull, great black-backed gull and black-throated diver. In addition, they exceed the 0.5% levels for breeding great black-backed gull, black guillemot and wintering cormorant. We also have healthy populations of many raptor species, some of which migrate across the Irish Sea. The conservation of these populations is important to us. The Committee recommends the appropriate consideration of bird data from Manx Birdlife. Manx Birdlife holds the national database for bird data. The TSC would request that the national bird status and conservation concerns of the Isle of Man are taken into	The Isle of Man species with greater than 0.5% of the UK or British Isles breeding or wintering seabird populations, as set out in the Isle of Man Government response have been considered in this ES (see **section 5.5.1**). In addition, where the conservation value of species has been considered this has included reference to relevant metrics for the Isle of Man (**section 5.6.5**). Assessment for all bird species that could be affected by impacts associated with the Transmission Assets, as identified in **section 5.6**, are provided in **section 5.11**. Where relevant, data from the Seabird Monitoring Programme, which incorporates data from the Isle of Man, has been used.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		account by reference to the recently published Manx Birds of Conservation Concern and we have a current concern regarding severe declines in many seabird populations on the Isle of Man (See http://manxbirdlife.im/seabirdcensus2017-18/). Schedule 1 of the Wildlife Act 1990 lists specially protected birds around the Isle of Man. Both of these sources are relevant to the status of these species in the vicinity of this development and in particular, the considerations of potential impacts on Manx populations. Of particular note is the seabird recovery project on the Calf of Man, under which Manx shearwater numbers are recovering and increasing, year on year, so it is important that the most up to date data are received from Manx National Heritage, the landowner, at the time of analysis. Annual updates are recommended if rerunning them. Our national interest lies in maintaining our national bird populations and so consideration of the effects on the IoM population levels and on key breeding colonies are requested and considered most appropriate to Isle of Man consultation, as these are the scales which are relevant to us.	
December 2022	**Scoping Opinion** Isle of Man Government	The TSC welcomes the scoping in of transboundary impacts on ornithology. Despite being outside UK territorial waters, Manx bird populations may be utilising this area, which lies within the foraging ranges of many seabird species.	Assessment of transboundary effects is provided in **section 5.13.5**. However, the Isle of Man is considered as part of the main assessment.
June 2023	EWG consultation meeting 1	RSPB – Consideration of impacts associated with lighting on OSPs in relation to impacts on Manx shearwater	Potential impacts associated with lighting on Transmission Assets are considered but scoped out in **section 5.7** as the booster station an OSPs are no longer included in the application.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
August 2023	EWG consultation meeting 2	Natural England raised the use of Lawson et al. (2016), though a more recent HiDef report was published in June 2023. Though it may not make a significant difference, it is best practice to look at the most recent available data.	Natural England have provided the Applicants with the data associated with HiDef Aerial Surveying Limited (2023) and these data have been used to inform relevant assessments (**sections 5.11 and 5.13).**
November 2023	**Statutory Consultation** Natural England	The Applicant has stated that there is no spatial or temporal overlap between the Transmission Assets and Tier 1 Projects and that therefore there are no cumulative effects for red-throated diver or common scoter. NE disagree with this. A full cumulative assessment should be carried out on the basis that other projects in the region are exerting a continuous displacement effect on sensitive species such as red-throated diver and common scoter.	A full cumulative effects assessment incorporating all relevant projects is provided in **section 5.13**.
November 2023	**Statutory Consultation** Natural England	Efforts should be made, as a matter of best practice, to minimise and mitigate disturbance to the receptor species of Liverpool Bay SPA. Disturbance should be minimised through the implementation of a Vessel Management Plan (VMP), a draft version of which should be presented as part of the DCO/dML application.	Measures adopted as part of the project are discussed in **section 5.8** (see also Volume 1, Annex 5.3: Commitments register of the ES). with any mitigation measures required discussed in the relevant assessment sections (**section 5.11** and **5.13**). Commitments regarding minimising vessel disturbance are addressed in **Table 5.15** (CoT65 and CoT111 - which addresses Liverpool Bay/Bae Lerpwl SPA, specifically). See also the Outline Vessel Traffic Management Plan (document reference J21) which has been developed to detail the plans to minimise vessel related disturbance.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
November 2023	**Statutory Consultation** Natural England	We note that no site-specific surveys have taken place. As with our previous comments on the Morgan Offshore Wind Project: Generation Assets PEIR, Natural England highlights the risk that the additional data analysis could have the potential to change the conclusions of the Environmental Statement from those set out in the PEIR, which could raise issues not flagged by the PEIR assessments.	Noted. 24 months of survey data from the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets projects have been incorporated into the identification of key receptors (see **section 5.6**). In addition other relevant datasets (e.g. HiDef Aerial Surveying Limited, 2023) have been used to inform the assessments for specific receptors. The approach to baseline characterisation is consistent to the approach taken for other similar transmission assets consent applications (such as Triton Knoll electrical system) and for applications incorporating both generation and transmission components of offshore wind farm developments (such as Awel y Môr Offshore Wind Farm).
November 2023	**Statutory Consultation** Natural England	Only the study by Lawson *et al.* (2016) has been used to calculate densities of receptor species within the red line boundary. This study used visual aerial survey techniques, which are no longer considered best practice. The study carried out by HiDef (2023) used digital aerial surveys to characterise the densities of key receptor species in the Liverpool Bay SPA. Although the Lawson *et al.* study covered a greater area, as the data from the HiDef study are more up-to-date and were produced with more appropriate survey techniques, they should be used to produce densities where possible.	Natural England have provided the Applicants with the data associated with HiDef Aerial Surveying Limited (2023) and these data have been used to inform relevant assessments (**sections 5.11 and 5.13).**
November 2023	**Statutory Consultation** Natural England	The adult survival rate from Horswill and Robinson (2015) has been used for comparison of the predicted mortality associated with the Project of the receptor species. However, as the species considered are non-breeding features of the Liverpool Bay SPA, the population will be composed of birds of all ages and not just adults, therefore a weighted mean survival rate	Baseline mortality rates used in the assessments represent the weighted mean survival rate across all age classes (**section 5.11**).

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		across all age classes should be used to calculate a mean mortality rate for the population. We note this would be consistent with the assessment for the Morecambe Offshore Windfarm: Generation Assets PEIR, as well as others. Use a weighted mean survival rate across all age classes to calculate a reference mean mortality rate for red-throated diver and common scoter.	
November 2023	**Statutory Consultation** Natural England	The Applicant state here that there is no temporal overlap between the Transmission Assets and any Tier 1 projects, while in **Table 5.39** there are multiple projects identified as overlapping temporally. The Applicant has used the reasoning that as there is no spatial or temporal overlap, there can be no cumulative effects on key receptor species. NE disagree with this. There is a clear temporal overlap between the construction and operation of the Transmission Assets and any other project in the region that is currently operational. While these projects are operational, several of them are likely to be exerting an ongoing displacement effect on the receptors screened in due to the presence of the turbines, and therefore their effects should be included in the cumulative assessment. For a full cumulative assessment to be carried out in the submitted ES, the numbers of the receptor species screened into the cumulative assessment which are subject to displacement mortality from ongoing/existing Tier 1 projects (in particular common scoter and red-throated diver) should be presented alongside the figures for the Transmission Assets.	A full cumulative assessment incorporating all relevant projects is provided in **section 5.13** and incorporates all projects that overlap with the Transmission Assets, spatially or temporally. This has been updated to include Tier 1 projects following Natural England's advice.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
November 2023	**Statutory Consultation** Natural England	As for EIA, only the Lawson et. al. (2016) study has been used to generate receptor densities. It would be more appropriate to use the HiDef (2023) study to generate densities within the Liverpool Bay SPA for the assessment of impacts, or justification should be provided for why this study has not been used.	Natural England have provided the Applicants with the data associated with HiDef Aerial Surveying Limited (2023) and these data have been used to inform relevant assessments (**sections 5.11 and 5.13)**.
November 2023	**Statutory Consultation** Natural England	Although the impacts of this project on the designated features of Liverpool Bay SPA are not likely to cause AEoI alone, given the pressure on SPA species across the site, efforts should still be made as a matter of best practice to minimise and mitigate disturbance to the receptor species. Disturbance should be minimised through the implementation of a Vessel Management Plan (VMP), a draft version of which should be presented as part of the DCO/dML application. As part of the VMP, the Applicant should also consider restricting activities which have the potential to disturb sensitive receptor species to months when those species are unlikely to be present, thus avoiding the potential for impacts entirely. Natural England has produced a best practice protocol for vessel movements in red-throated diver SPAs, and we recommend this is incorporated in the VMP.	Measures adopted as part of the project and relevant to offshore ornithology are discussed in **section 5.8** (See also Volume 1, Annex 5.3: Commitments register of the ES) with any mitigation measures required discussed in the relevant assessment sections (**sections 5.11** and **5.13**). Commitments regarding minimising vessel disturbance are addressed in **Table 5.15** (CoT65 and CoT111 - which addresses Liverpool Bay/Bae Lerpwl SPA, specifically). See also the Outline Vessel Traffic Management Plan (document reference J21) which has been developed to detail the plans to minimise vessel related disturbance.
November 2023	**Statutory Consultation** Natural England	While the number of common scoters at risk of mortality is below the threshold advised for further investigation for project- alone impacts, this does not mean that an in-combination assessment should not be carried out. A full in-combination assessment of the impact of projects in the region along with the Transmission Assets on the common scoter feature of Liverpool Bay SPA should be carried out.	A full cumulative assessment of the effects upon offshore ornithology receptors, including common scoter, incorporating all relevant projects, is provided in **section 5.13**.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
November 2023	**Statutory Consultation** Natural England	**Matrix to Determine Effect Significance** We acknowledge that a matrix approach to determining the significance of effects on ecological features, is commonly used. However, this method often relies on value- rather than evidence-based judgements. The subjective evaluation of magnitude of impact and sensitivity/importance of receptors through expert judgement has led to many impact magnitudes and receptor importance/ sensitivities being downgraded across topics in the PEIR. We also note that any effect that is concluded to be of moderate or major significance in the PEIR, is deemed to be 'significant' in EIA terms, whereas effects concluded to be of negligible or minor significance, are deemed 'not significant' in EIA terms. This cut-off could exclude any effect concluded to be less than moderate, in turn, this could lead to errors in assessing cumulative effects adequately.	The matrix approach is used as an initial indicator of significance with expert judgement used to determine if the identified significance within the matrix is correct. The assessments presented utilise the most recent relevant science and evidence. This accompanied with expert judgement, which is applied in all cases to ensure the level of significance identified by the matrix approach is correct, is considered to provide a robust consideration of the likely significance of impact on ornithological receptors.
November 2023	**Statutory Consultation** Natural England	**Offshore Ornithology** Justification should be provided for only using the Lawson *et al.* data, otherwise we recommend an approach whereby the HiDef (2023) study is used to produce densities for receptor species within the Liverpool Bay SPA, as far as the survey area covered, and the Lawson *et al.* (2016) data is used to cover areas that the HiDef survey did not extend to.	Natural England have provided the Applicants with the data associated with HiDef Aerial Surveying Limited (2023) and these data have been used to inform relevant assessments (**sections 5.11 and 5.13)**.
November 2023	**Statutory Consultation** Natural England	Natural England disagrees that there are no cumulative effects for red-throated diver or common scoter. A full cumulative assessment should be carried out on the basis that other projects in the region are exerting a continuous displacement effect on sensitive species such as red-throated diver and common scoter.	A full cumulative assessment of the effects upon offshore ornithology receptors, including common scoter and red-throated diver, incorporating all relevant projects, is provided in **section 5.13**.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
November 2023	**Statutory Consultation** Isle of Man Department of Infrastructure	**Data Sources** The TSC would draw the applicant's attention to the Manx Marine Environmental Assessment2 (MMEA) which provides a useful overview of the Island's marine environment and should be taken into account as part of both the transboundary and possibly also the cumulative impacts assessment as part of this application. More detail will be provided below in respect of specific areas of the MMEA that should be reviewed. In addition to this broad statement, the TSC has provided specific comments, over subsequent pages, in relation to the individual chapters of the PEIR, and collated on behalf of various contributors within the responsible Departments of the Isle of Man Government	The Isle of Man is not considered to be transboundary in this ES and has been included in the main assessment presented in sections 5.11 and 5.13. The MMEA has been consulted as part of the assessments presented and relevant aspects incorporated.
November 2023	**Statutory Consultation** Natural Resources Wales (NRW) Advisory	We also note that the assessments for the red-throated diver and common scoter features of the Liverpool Bay/Bae Lerpwl SPA use the adult survival rates from Horswill & Robinson (2015) to calculate the mortality rates. As Liverpool Bay/Bae Lerpwl SPA is designated for non-breeding populations of these species and impacts could be on birds of all ages and not just adults, we recommend that a weighted mean survival across all age-classes is used to calculate a weighted mean mortality rate. We note that this is consistent with the approaches taken by other offshore wind farm assessments, including for the Liverpool Bay/Bae Lerpwl SPA assessments in the Morecambe Offshore Windfarm: Generation Assets project PEIR in the draft Report to Inform the Appropriate Assessment.	Baseline mortality rates used in the assessments represent the weighted mean survival rate across all age classes (**section 5.11**).

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
November 2023	**Statutory Consultation** NRW Advisory	Whilst the impacts to Liverpool Bay/Bae Lerpwl SPA from the project alone are expected to be very small and it is considered probable that an AEOI can be ruled out for the project alone, we would suggest that as a matter of best practice the best practice vessel movements etc to minimise disturbance/ displacement to red-throated diver and common scoter noted in paragraphs 1.10.3.151 and 1.10.3.153 of the ISAA report are secured in the DCO or dML. We note that this commitment was made in the Mona OWF project PEIR.	Measures adopted as part of the project and relevant to offshore ornithology are discussed in **section 5.8** (See also Volume 1, Annex 5.3: Commitments register of the ES) with any mitigation measures required discussed in the relevant assessment sections (**section 5.11**and **5.13**) Commitments regarding minimising vessel disturbance are addressed in **Table 5.15** (CoT65 and CoT111 - which addresses Liverpool Bay/Bae Lerpwl SPA, specifically). See also the Outline Vessel Traffic Management Plan (document reference J21) which has been developed to detail the plans to minimise vessel related disturbance and relevant commitments (CoT69, CoT110 and CoT111)
November 2023	**Statutory Consultation** NRW Advisory	We would also suggest that the Applicants give consideration to timing restrictions on construction activities, such that the potential disturbing activities in different areas (offshore, cable land fall etc) avoid key periods when sensitive features of the Liverpool Bay/Bae Lerpwl SPA are present in key numbers.	Measures adopted as part of the project are discussed in **section 5.8** (See also Volume 1, Annex 5.3: Commitments register of the ES) with any mitigation measures required discussed in the relevant assessment sections (**section 5.11)** Commitments regarding timing restrictions on construction activities, including in the Liverpool Bay/Bae Lerpwl SPA (with particular reference to wintering red-throated diver and common scoter), are addressed in **Table 5.15** (CoT110 and CoT111).

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
February 2024	EWG meeting 3	The data included in the assessments for the Morgan Offshore Wind Project: Generation Assets project and Morecambe Offshore Windfarm: Generation Assets project are from the PEIRs, which were based on only 12 months of survey data. We note that these will be updated to include data for the full 24 months of surveys for each of these projects ahead of their submissions and hence the assessments for the Morgan and Morecambe Transmission Assets will require updating and are hence subject to change.	24 months of baseline aerial survey data from the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets projects have been incorporated into the identification of key receptors (see **section 5.6**). The surveys used to collect these data followed standard industry guidance. The approach to baseline characterisation is consistent to the approach taken for other similar transmission assets consent applications (such as Triton Knoll electrical System) and for applications incorporating both generation and transmission components of offshore wind farm developments (such as Awel y Môr Offshore Wind Farm).
February 2024	EWG meeting 3	It was raised by the Applicant that the Transmission Assets Application no longer includes the Morgan offshore booster station.	The Morgan offshore booster station is no longer included in the project design (See Project Design Envelope provided in Volume 1, Chapter 3: Project description of the ES). In addition the offshore substation platforms and inter-connector cables are not incorporated into the assessments presented, as they no longer form part of the Project design, and are included in the respective Generation Assets DCO Applications.
February 2024	EWG meeting 3	It was agreed that potential cumulative disturbance/displacement impacts will be restricted to temporary disturbance and displacement during construction only and therefore, for the cumulative assessment, the focus will be on a qualitative assessment, considering the temporary nature of the project impacts.	This cumulative assessment is included in **section 5.13**

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
February 2024	EWG meeting 3	It was raised that the Lawson *et al.* (2016) data was used to quantify the disturbance impact and that the use of data from HiDef Aerial Surveying Limited (2023) would be recommended	Natural England have provided the Applicants with the data associated with HiDef Aerial Surveying Limited (2023) and these data have been used to inform relevant assessments (**sections 5.11 and 5.13)**.

5.4 Study area

5.4.1.1 The following study areas are defined to inform the assessments of the Transmission Assets:

- The Transmission Assets offshore ornithology study area;
  - This study area is defined as the Transmission Assets Order Limits: Offshore (hereafter referred to as the Offshore Order Limits) plus a 15 km buffer area
- The Transmission Assets offshore ornithology regional study area;
  - This study area is species, season, impact and assessment stage specific. It is dependent on the ecology of each individual species, and is defined, where appropriate, in relevant sections of the Environmental Statement.

5.4.1.2 No specific surveys of the Transmission Assets offshore ornithology study area have been undertaken consistent with standard industry practice for transmission assets with limited to no sea surface piercing infrastructure as per the applications for previous offshore wind farms. However, 24 months of surveys were undertaken within the Offshore Order Limits for the Morgan Offshore Wind Project: Generation Assets (including a 10 km buffer) and 24 months of survey were undertaken for the Morecambe Offshore Windfarm: Generation Assets (including a buffer extending to either 10 km for red-throated diver and 4 km for all other species). The Generation Assets areas covered by these surveys are presented in (Figure 5.1, Volume 2, Chapter figures). These areas are incorporated into the Transmission Assets offshore ornithology study area.

5.4.1.3 In addition, the desktop study undertaken to identify key receptors has utilised information from a wider regional area. Seabirds and migratory birds are highly mobile species and there is potential for birds occurring within the study area to have originated from more distant locations (e.g., a breeding colony) that varies depending on the ecology of the species under consideration. Published foraging ranges (Woodward *et al.*, 2019) and regional population scales (Furness, 2015), amongst other relevant sources of information have been reviewed to define the regional study area relevant to each species.

5.4.1.4 The study areas (i.e. zones of influence) defined for the assessment of impacts associated with the Transmission Assets are presented in **Table 5.4** and shown in Figure 5.1, (Volume 2, Chapter figures).

Table 5.4: Zone of Influence for each impact

Impact	Development phase	Zone of influence (ZOI) of impact	Justification
Disturbance and displacement from underwater sound and presence of vessels and infrastructure.	Construction/ Decommissioning	Footprint of the Transmission Assets plus 2 km buffer (cable)	Based on evidence provided by Schwemmer *et al.* (2011). Study area is consistent with the study areas used in the assessments of disturbance on key receptors (e.g., red-throated diver and common scoter) at other offshore wind projects for impacts associated with the export cable (e.g. RWE Renewables UK, 2022).
Indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species	All phases	Footprint of the Transmission Assets plus 2 km buffer	Study area is consistent with the study areas used in the assessments of disturbance on key receptors (e.g., red-throated diver and common scoter) at other offshore wind projects for impacts associated with the export cable (e.g. RWE Renewables UK, 2022).
Temporary habitat loss/disturbance and increased SSCs.	All phases	Footprint of the Transmission Assets plus 15 km buffer associated with tidal extent	Considered appropriately precautionary based on maximum extent of tidal movements and as used in previous assessments for similar impacts (e.g., NIRAS Group (UK) Ltd., 2022).

5.5 Baseline methodology

5.5.1 Methodology for baseline studies

Generation Assets Survey Data

5.5.1.1 No specific surveys of the Transmission Assets area have been undertaken consistent with standard industry practice for Transmission Assets and the applications for previous offshore wind farms. However, 24 months of surveys were undertaken within the Offshore Order Limits for the Morgan Offshore Wind Project: Generation Assets (including a 10 km buffer) and 24 months of survey were undertaken for the Morecambe Offshore Windfarm: Generation Assets (including a buffer extended to either 4 or 10 km). Desk studies

5.5.1.2 A comprehensive desk-based review was undertaken to inform the baseline for offshore ornithology. Information on offshore ornithology within the study area (Transmission Assets footprint and the maximum ZOI buffer i.e. 15 km) was collected through a detailed desktop review. The existing studies and datasets referred to as part of the desk-based review are summarised in **Table 5.5** below.

Table 5.5: Summary of desktop study sources

Title	Source	Year	Author	Notes
Morecambe Offshore Windfarm: Generation Assets Environmental Statement	Morecambe Offshore Windfarm Ltd	2024	Royal HaskoningDHV/ Morgan Offshore Wind Ltd	-
Morgan Offshore Wind Project Generation Assets Environmental Statement	Morgan Offshore Wind Ltd	2024	RPS/Morgan Offshore Wind Ltd S	-
Densities of qualifying species within Liverpool Bay/Bae Lerpwl SPA: 2015 to 2020	Available online	2023	HiDef Aerial Surveying Limited	Digital video aerial surveys conducted between 2015 and 2020 to provide updated density and abundance estimates for red-throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*) and the waterbird assemblage within the Liverpool Bay/Bae Lerpwl SPA.

Title	Source	Year	Author	Notes
Protected site networks	Joint Nature Conservation Committee (JNCC), NatureScot SiteLink (Scotland), Natural England (England), NRW (Wales), DAERA (Northern Ireland), NPWS (Ireland), DEFA (Isle of Man)	2024	JNCC, NatureScot SiteLink (Scotland), Natural England (England), NRW (Wales), DAERA (Northern Ireland), NPWS (Ireland), DEFA (Isle of Man)	Standard data forms, conservation objectives and other information relevant to the designation of protected sites
Seabird Population Trends and Causes of Change	JNCC	2021	JNCC	Seabird Monitoring Program report providing UK breeding seabird population trends
Seabird Monitoring Programme	JNCC	2023	JNCC	Online database including colony count data for seabirds that regularly breed in Britain and Ireland
Seabirds Count	Burnell *et al.* (2023)	2023	Burnell *et al.*	The fourth breeding seabird census of Britain and Ireland
Non-breeding season populations of seabirds in UK waters.	Furness (2015)	2015	Furness	Provides non-breeding season populations for all of UK waters. Also provides seasonal extents for multiple species.
Identifying important at-sea areas for seabirds using species distribution models and hotspot mapping	Cleasby *et al.* (2020)	2020	Cleasby *et al.*	Identifying important at-sea areas for seabirds using species distribution models and hotspot mapping for four seabird species: kittiwake (*Rissa tridactyla*), guillemot (*Uria aalge*), razorbill (*Alca torda*) and shag (*Gulosus aristotelis*).
Distribution maps of cetacean and seabird populations in the North-East Atlantic	Waggitt *et al.* (2019)	2020	Waggitt *et al.*	-
Desk-based revision of seabird foraging ranges used for HRA screening	Woodward *et al.* (2020)	2019	Woodward *et al.*	Provides foraging range data for seabird species in UK waters.

Title	Source	Year	Author	Notes
Seabird Mapping and Sensitivity Tool (SeaMAST)	Bradbury *et al.* (2014)	2014	Bradbury *et al.* (2014)	SeaMaST provides evidence on the use of sea areas by seabirds and inshore waterbirds in English territorial waters, mapping their relative sensitivity to offshore wind farm developments
Breeding density, fine-scale tracking and large-scale modelling reveal the regional distribution of four seabird species	Wakefield *et al.* (2017)	2017	Wakefield *et al.*	Provides modelled regional distributions for kittiwake, guillemot, razorbill and shag
An assessment of the numbers and distributions of wintering waterbirds and seabirds in Liverpool Bay/Bae Lerpwl area of search	Lawson *et al.* (2016)	2016	Lawson *et al.*	An assessment of wintering waterbirds and seabirds to support the extension of the Liverpool Bay SPA
Quantifying foraging areas of little tern around its breeding colony SPA during chick-rearing	Parsons *et al.* (2015)	2015	Parsons *et al.*	Foraging areas of little tern from various UK colonies
Quantifying usage of the marine environment by terns Sterna sp. around their breeding colony SPAs	Wilson *et al.* (2014)	2014	Wilson *et al.*	Foraging areas of tern species from various UK colonies
Report to Inform Appropriate Assessment: Offshore Wind Leasing Round 4. Plan Level HRA	The Crown Estate	2021/2022	NIRAS	-

Title	Source	Year	Author	Notes
The status of our bird populations: the Fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain	Stanbury *et al.* (2021)	2021	Stanbury *et al.*	-
Birds of Conservation Concern in the Isle of Man (BoCCIoM)	Manx Birdlife	2021	Manx Birdlife	The first comprehensive assessment of the conservation status of wild birds in the Isle of Man

5.6 Baseline environment

5.6.1 Desk study

5.6.1.1 Information on offshore ornithology within the study area was collected through a detailed review of existing studies and datasets.

5.6.1.2 The Transmission Assets are situated in the east part of the Irish Sea. The Irish Sea separates the islands of Ireland and Great Britain; linked to the Celtic Sea in the south by St George's Channel and to the Inner Seas off the West Coast of Scotland in the north by the North Channel (also known as the Straits of Moyle).

5.6.1.3 Twenty-one species of seabird have been reported as regularly nesting on beaches or cliffs around the Irish Sea (Mitchell *et al.*, 2004) and a large proportion of the Manx shearwater *Puffinus puffinus* biogeographic population has been found breeding on offshore islands around the Irish Sea. Most of the world's Manx shearwater population is found in the United Kingdom (UK) and over 90% of the UK population is found on the Islands of Rum, Egg (Scotland), Skomer and Skokholm (Wales) (Mitchell *et al.*, 2004; JNCC, 2021). Other abundant and widespread seabird species in the central Irish Sea include gannet *Morus bassanus*, guillemot, herring gull *Larus argentatus*, kittiwake, lesser black-backed gull *Larus fuscus*, Manx shearwater and razorbill.

5.6.1.4 During the non-breeding season, large populations of common scoter *Melanitta nigra* and red-throated diver *Gavia stellata* use the shallow waters of Liverpool Bay (Lawson *et al.*, 2016, Natural England 2023).

5.6.1.5 The Scoping Report response by the Isle of Man Government identified that populations on the Isle of Man exceed 1% of the UK or British Isles breeding seabird populations for herring gull, little tern, shag and cormorant and for wintering populations of shag, herring gull, great black-backed gull and black-

throated diver. In addition they exceed the 0.5% levels for breeding great black-backed gull, black guillemot and wintering cormorant.

5.6.1.6 A desktop review of boat-based and aerial survey data analysed by Waggitt *et al.* (2020) and Bradbury *et al.* (2014) revealed key patterns of temporal and spatial use in the study area. These are summarised in Table 5.6..

Table 5.6: Abundance and distribution of species across the Transmission Assets offshore ornithology study area

Species	Abundance in Waggitt *et al.* (2020)	Abundance in Bradbury *et al.* (2014)
Eider	Not included in Waggitt *et al.* (2020)	Low densities in inshore areas in non-breeding season
Common scoter	Not included in Waggitt *et al.* (2020)	Low densities overlapping with study area in breeding and non-breeding seasons
Kittiwake	Lowest abundance recorded during the breeding season (March to September). Similar distribution in the non-breeding season (October to February) although slight increase in densities across the Transmission Assets	Small area of moderate density to the north east of the study area during the non-breeding season with widespread low densities throughout the breeding season
Black-headed gull	Not included in Waggitt *et al.* (2020)	Low densities in inshore areas during breeding season and non-breeding season
Little gull	Not included in Waggitt *et al.* (2020)	Low densities within study area during the non-breeding season
Common gull	Not included in Waggitt *et al.* (2020)	Low densities in inshore areas during breeding season. More widespread in non-breeding season
Great black-backed gull	Not included in Waggitt *et al.* (2020)	In the breeding season area of moderate density offshore overlaps with Transmission Assets, low densities elsewhere. Low densities in the non-breeding season
Herring gull	Restricted coastal distribution during the breeding season (April to August) Abundance lower in non-breeding season with a wider distribution	Restricted coastal distribution during the breeding season. Low densities where overlap with the study area occurs. Abundance lower in non-breeding season with a wider distribution
Lesser black-backed gull	Very restricted coastal distribution in the breeding season (April to August)	Area of high densities to the north of the study area in the breeding season, low densities throughout the study area. Area of high density close to shore within study area during the non-breeding season

Species	Abundance in Waggitt *et al.* (2020)	Abundance in Bradbury *et al.* (2014)
Sandwich tern	Not included in Waggitt *et al.* (2020)	Low densities present in Transmission Assets Area of Search in the breeding season. Not present in the non-breeding season
Little tern	Not included in Waggitt *et al.* (2020)	Not present
Common tern	Not included in Waggitt *et al.* (2020)	Not present
Arctic tern	Not included in Waggitt *et al.* (2020)	Not present
Great skua	Very low densities across all months	Not present
Arctic skua	Not included in Waggitt *et al.* (2020)	Not present
Guillemot	Distribution similar in the breeding (March to July) and non-breeding seasons (August to February) although abundance greater in the non-breeding season	Moderate densities overlapping with study area in the breeding season. Moderate densities to the north east of the study area during the non-breeding season. Low densities elsewhere in both seasons
Razorbill	Similar distribution to guillemot albeit lower abundance	Area of high density to the north east of Study Aera in the breeding season, very low densities throughout study area. Areas of low density within study area during non-breeding season
Puffin	Very low densities across study area	Not present
Red-throated diver	Not included in Waggitt *et al.* (2020)	Low densities present in study area during non-breeding season
Storm petrel	Very low densities across all months	Not present
Fulmar	Low densities increasing as distance from coast increased	Low densities and distribution widespread in the non-breeding season (September to December) and breeding season (January to August)
Manx shearwater	Densities very low across all months, especially, as expected, during the non-breeding season (September to March)	Low densities during the breeding season (April to August)
Gannet	Highest densities to the west of the Morgan Offshore Wind Project: Generation Assets in the breeding season (March to September) and non-breeding season (October to February)	Of the birds recorded, the highest densities occurred to the north east of the Morgan Offshore Wind Project: Generation Assets during the breeding season
Cormorant	Not included in Waggitt *et al.* (2020)	Low densities in inshore areas throughout the year, extending slightly further offshore in the non-breeding season
Shag	Very low to low densities across all months	Not present

5.6.2 Designated sites

Identification of statutory designated sites

5.6.2.1 All designated sites within the study area for the Transmission Assets with qualifying interest features that could be affected by the construction, operations and maintenance, and decommissioning phases of the Transmission Assets were identified using the process described below.

5.6.2.2 The approach to identification is consistent with the approach taken in the HRA Stage 1 Screening Report for the Transmission Assets (document reference E3) and the sites listed in **Table 5.7** are consistent with the sites for which Likely Significant Effects (LSE) were identified in the HRA Stage 1 Screening Report for the Transmission Assets. These are shown in Figure 5.2 (Volume 2, Chapter figures).

5.6.2.3 Based on the likely magnitude of impacts associated with the project and the distance between the Transmission Assets and any non-UK designated sites, no LSE was concluded for all designated sites outside of UK waters.

5.6.2.4 With regards to designated sites, only designated sites and qualifying features for which LSE was identified during the HRA Stage 1 Screening Report for the Transmission Assets are considered in this chapter.

Table 5.7: Designated sites and relevant qualifying interests (as taken from the HRA Stage 1 Screening Report)

Designated site	Distance to the Transmission Assets (nearest point by sea) (km)	Relevant qualifying interest (offshore features only)	
		Features for which a potential LSE was identified	Other features
Liverpool Bay SPA	0.00	Red-throated diver Cormorant Common scoter Red-breasted merganser	Common tern Little tern Little gull
Ribble & Alt Estuaries Ramsar	0.00	Red-throated diver Cormorant Common scoter	Black-headed gull Common tern
Ribble & Alt Estuaries SPA	0.00	Common scoter Cormorant Scaup	Black-headed gull Common tern Lesser black-backed gull

Designated site	Distance to the Transmission Assets (nearest point by sea) (km)	Relevant qualifying interest (offshore features only)	
		Features for which a potential LSE was identified	Other features
Morecambe Bay and Duddon Estuary SPA	15.8	Cormorant Eider Red-breasted merganser	Common tern Herring gull Lesser black-backed gull Mediterranean gull Black-headed gull Common gull Little tern Sandwich tern
Morecambe Bay Ramsar	15.8	Cormorant Eider Red-breasted merganser	Herring gull Lesser black-backed gull Sandwich tern

Liverpool Bay SPA

Site description

5.6.2.5 Liverpool Bay is situated in the east of the Irish Sea, bordering the north west of England and the north of Wales and running as a broad arc from Morecambe Bay to the east coast of Anglesey.

5.6.2.6 The Liverpool Bay/Bae Lerpwl SPA lies in both English and Welsh territorial waters and in offshore UK waters. The border between English and Welsh territorial waters running north west from the Dee Estuary. The Offshore Order Limits falls within the SPA.

5.6.2.7 The SPA qualifies under Article 4.1 of the Birds Directive for its non-breeding (wintering) populations of red-throated diver and little gull *Hydrocoloeus minutus* and for providing foraging areas for breeding little tern *Sternula albifrons* and common tern *Sterna hirundo*.

5.6.2.8 The SPA also qualifies under Article 4.2 of the Birds Directive for its non-breeding (wintering) population of common scoter *Melanitta nigra* as well as its wintering waterbird assemblage, which includes over 1% of the Great Britain population of cormorant and red-breasted merganser *Mergus serrator*.

5.6.2.9 The SPA covers an area of approximately 2,528 km^2. The SPA was originally designated in 2010 for its wintering red-throated diver and common scoter and covered an area of approximately 1,703 km^2. The SPA was extended in 2017, in order to support three new protected features: wintering little gulls and also foraging little terns and common terns. Wintering red-breasted merganser and cormorant also became new named components of the waterbird assemblage.

5.6.2.10 The original SPA boundary was delineated primarily based on the abundance and distribution of red-throated diver except in the north most region which was delineated based on the distribution and abundance of common scoter. When the SPA was extended, the new areas beyond the original boundary were designated due to the abundance and distribution of little gull.

5.6.2.11 The offshore ornithological features of the Liverpool Bay/Bae Lerpwl SPA where LSE could not be ruled out at HRA screening stage are red-throated diver, common scoter, cormorant and red-breasted merganser.

Data from Lawson *et al.* (2016)

5.6.2.12 A study by Lawson *et al.* in 2016 assessed the numbers and distributions of wintering waterbirds and seabirds in Liverpool Bay/Bae Lerpwl area.

5.6.2.13 Liverpool Bay/Bae Lerpwl SPA was classified in 2010 for the protection of wintering red-throated diver, common scoter and an assemblage of greater than 20,000 waterfowl. The Lawson *et al.* (2016) report analyses additional survey data from the winter seasons of 2007/08 and 2010/11 in order to re-assess the number of waterbirds and seabirds within Liverpool Bay/Bae Lerpwl area of search.

5.6.2.14 The aim of the report was to determine whether any species could be considered under the SPA guidelines for protection within the site as interest features in their own right, in addition to the red-throated diver and common scoter populations which were identified for classification in the Liverpool Bay/Bae Lerpwl SPA in 2010. The results were also assessed to see whether any named component species should be added to the existing assemblage within Liverpool Bay/Bae Lerpwl SPA.

5.6.2.15 Eight winter seasons of aerial survey data (2001/02, 2002/03, 2003/04, 2004/05, 2005/06, 2006/07, 2007/08, 2010/11) were analysed assessed against the UK SPA selection guideline thresholds (Stroud *et al.* 2001) to determine whether any species occurred in numbers exceeding these thresholds.

5.6.2.16 In addition to red-throated diver and common scoter, the estimated populations within the area of search indicated this was an important site for little gull, with a mean of peak population estimate of 333 individuals within Liverpool Bay/Bae Lerpwl area of search. The highest densities of little gull were consistently located offshore of Blackpool and the Ribble Estuary, close to the 12 nautical mile line. In addition, cormorant and red-breasted merganser were present in sufficient numbers to be added as named component species of the existing assemblage feature (i.e. nationally important, >1% of the Great Britain population).

5.6.2.17 Eider also exceeded the relevant thresholds within the area of search. However, these numbers did not occur within the potential revised SPA boundary. Therefore, eider were not present in sufficient numbers to be added as named component species of the existing assemblage feature.

5.6.2.18 Red-throated diver were found to be abundant throughout Liverpool Bay SPA, with the majority of the SPA boundary delineated based on the distribution of this species. The highest densities of the species occur off the Lancashire coast at Formby, off the coast of the Wirral, offshore of Llandulas

on the north Wales coast and off the coast of Penmaenmawr, north Wales. Part of the Offshore Order Limits passes through an area of moderate density of red-throated diver. Refer to Figure 5.4 (Volume 2, Chapter figures) for a map of red-throated diver distribution throughout Liverpool Bay.

5.6.2.19 Common scoter were shown to aggregate in two main areas: to the north west of Rhyl and to the west of Blackpool. The Offshore Order Limits passes through the south edge of the aggregation to the west of Blackpool. Refer to Figure 5.3 (Volume 2, Chapter figures) for a map of common scoter distribution throughout Liverpool Bay.

5.6.2.20 Little gulls were scattered throughout the Liverpool Bay SPA. However, there was an aggregation to the west of the Ribble Estuary and the Offshore Order Limits passes through this area. Lawson *et al.* (2016) was referenced to inform this assessment of little gull distribution throughout Liverpool Bay.

5.6.2.21 The distributions of cormorant, red-breasted merganser and eider were not mapped. However, the overall waterbird assemblage was mapped and showed aggregations in two main areas: to the north west of Rhyl and to the west of Blackpool, with this reflecting the distribution of common scoter, the most abundant component of the assemblage.

Data from NECR440 (HiDef Aerial Surveying Limited, 2023)

5.6.2.22 HiDef Aerial Surveying Ltd ('HiDef'), on behalf of Natural England, published a Research Report (NECR440) in 2023 on the densities of qualifying species within the Liverpool Bay/Bae Lerpwl SPA (the original boundary as designated in 2010), based on data from 2015 to 2020.

5.6.2.23 Digital video aerial surveys were conducted between 2015 and 2020 by HiDef and commissioned by DONG and Ørsted as part of their post-consent monitoring programme for Burbo Bank Extension offshore wind farm. In total, eight surveys were completed between January and March in 2015, 2018, 2019 and 2020, covering the original SPA boundary designated in 2010.

5.6.2.24 The aim of this monitoring programme and report was to provide updated density and abundance estimates for red-throated diver, common scoter and the waterbird assemblage within the SPA. Estimates for other species, including little gull, red-breasted merganser and cormorant were included in the report as components of the waterbird assemblage.

5.6.2.25 Red-throated diver were one of the most abundant species recorded, with population estimates throughout the survey period ranging from 372 birds in January 2018 to 2,073 birds in March 2020. Red-throated diver were shown to aggregate in two main areas: to the north west of Rhyl and a broad area to the west of the Ribble Estuary. The Offshore Order Limits passes through part of the aggregation to the west of Blackpool, as shown in Figure 5.4 (Volume 2, Chapter figures).

5.6.2.26 Common scoter were the most abundant species recorded, with population estimates ranging between 78,797 birds in March 2020 and 202,224 birds in February 2015. Common scoter were well distributed throughout the SPA, with aggregations varying over the survey period. However, the Offshore

Order Limits encompassed an area of regularly occurring high common scoter densities.

5.6.2.27 Population estimates of little gull fluctuated, ranging from no birds in February 2015, January 2019 and February 2020, to 286 birds in February 2019. When little gulls were present, there was typically an aggregation to the west of the Ribble & Alt Estuaries. The Offshore Order Limits passes through this little gull aggregation area (refer to Figures 14 and 15 in HiDef Aerial Surveying Limited, 2023).

5.6.2.28 Population estimates of cormorants were variable, with population estimates ranging from 234 birds in March 2020, to 3,180 birds in February 2015. Cormorants were distributed throughout the SPA, with the greatest aggregations to the west of the mouth of the River Mersey. The Offshore Order Limits does not pass through the greatest aggregations of cormorants (refer to Figures 10 and 11 in HiDef Aerial Surveying Limited, 2023).

5.6.2.29 Red-breasted merganser population estimates ranged from 11 birds in February 2020 to 156 birds in February 2019. Red-breasted merganser were well distributed throughout the SPA, with aggregations varying over the survey period. The Offshore Order Limits does not pass through an area of red-breasted merganser aggregations (refer to Figures 12 and 13 in HiDef Aerial Surveying Limited, 2023).

5.6.2.30 Over the survey period, population estimates calculated for the waterbird assemblage varied, ranging from 101,831 birds in March 2020 to 216,824 birds in February 2015. The waterbirds were well distributed throughout the SPA.

Ribble & Alt Estuaries Ramsar site

5.6.2.31 The Ribble & Alt Estuaries Ramsar site occupies a stretch of coastline between Liverpool and Preston on the north west coast of England. It lies between the Mersey estuary and Morecambe Bay and is directly adjacent to the Liverpool Bay SPA.

5.6.2.32 The Ramsar site forms a large area, including two estuaries which form part of the chain of west coast sites which fringe the Irish Sea. The site is formed by extensive sand and mudflats backed, in the north, by the saltmarsh of the Ribble Estuary and, to the south, the sand dunes of the Sefton Coast. The tidal flats and saltmarsh support internationally important populations of waterfowl in winter and the sand dunes support vegetation communities and amphibian populations of international importance.

5.6.2.33 Ribble & Alt Estuaries Ramsar site was designated in 1995 and covers an area of 13,464.1 ha.

5.6.2.34 The Ribble & Alt Estuaries Ramsar site is designated under Ramsar Criterion 6 for its:

- breeding population of lesser black-backed gull *Larus fuscus graellsii*;
- spring/autumn passage populations of ringed plover *Charadrius hiaticula*, grey plover *Pluvialis squatarola*, knot *Calidris canutus islandica*, sanderling *Calidris alba*, dunlin *Calidris alpina*, black-tailed godwit *Limosa*

limosa islandica, redshank *Tringa totanus* and lesser black-backed gull; and

- winter populations of Bewick's swan *Cygnus columbianus bewickii*, whooper swan *Cygnus*, pink-footed goose *Anser brachyrhynchus*, shelduck *Tadorna tadorna*, wigeon *Anas Penelope*, teal *Anas crecca*, pintail *Anas acuta*, oystercatcher *Haematopus ostralegus* and bar-tailed godwit *Limosa lapponica lapponica*.

5.6.2.35 The Ramsar site is also designated under Ramsar criterion 5 for supporting a wintering waterfowl assemblage of international importance (222,038 waterfowl based on a five year peak mean 1998/99-2002/2003).

5.6.2.36 In addition, the Ribble & Alt Estuaries Ramsar site citation also lists a number of noteworthy fauna species, with over 1% of the Great Britain population occurring within the Ramsar site during one of the seasons (breeding, spring/autumn passage and/or winter). This includes offshore ornithological features, such as breeding common tern and black-headed gull *Larus ridibundus* and wintering black-headed gull, red-throated diver, common scoter and cormorant.

5.6.2.37 The waders, geese and duck qualifying features of the Ramsar site are typically associated with the intertidal estuary areas, rather than the offshore waters. Therefore, waders, geese and ducks have been scoped out of further assessment for offshore impacts. Where appropriate, these species will be included in the intertidal ornithology assessment (Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES) and the Habitats Regulation Assessment Stage 2 Information to Support an Appropriate Assessment (document reference E2.1)

5.6.2.38 The offshore ornithological features of the Ribble & Alt Estuaries Ramsar site where LSE could not be ruled out during the HRA screening are red-throated diver, common scoter and cormorant.

Ribble & Alt Estuaries SPA

5.6.2.39 The Ribble & Alt Estuaries SPA lies on the coast of Lancashire and Sefton in north west England. The SPA encompasses all or parts of the Ribble Estuary Site of SSSI and Sefton Coast SSSI and their ornithological features in addition to the Ribble Estuary NNR. Therefore, these SSSIs are associated features and are not discussed further. The SPA covers an area of 12,412.31 ha. The SPA was designated in 1995 (subsuming the Alt Estuary SPA and the Ribble Estuary SPA) and an extension at the south end of the Sefton Coast SSSI, was classified in 2002. The Ribble & Alt Estuaries SPA is directly adjacent to the Liverpool Bay SPA.

5.6.2.40 The SPA comprises two estuaries, of which the Ribble is by far the larger, together with an extensive area of sandy foreshore along the Sefton Coast and forms part of the chain of west coast SPAs that fringe the Irish Sea. Indeed, there is considerable interchange in the movements of birds between the Ribble & Alt Estuaries SPA and Morecambe Bay, Mersey Estuary, Dee Estuary and Martin Mere.

5.6.2.41 A large proportion of the SPA is within the Ribble Estuary National Nature Reserve. The site consists of extensive areas of sand and mudflats and, particularly in the Ribble, large areas of saltmarsh. There are also areas of coastal grazing marsh.

5.6.2.42 The site qualifies under article 4.1 of the Birds Directive as it is used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season (English Nature, 2002).

- Breeding ruff *Philomachus pugnax* and common tern.
- Wintering Bewick's swan, whooper swan, golden plover *Pluvialis apricaria*, bar-tailed godwit.

5.6.2.43 The site qualifies under article 4.2 of the Birds Directive as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season.

- Breeding lesser black-backed gull.
- Passage populations of ringed plover, sanderling and redshank.
- Wintering pink-footed goose, shelduck, wigeon, teal, pintail, oystercatcher, grey plover, knot, sanderling, dunlin, black-tailed godwit and redshank.

5.6.2.44 The SPA also qualifies under article 4.2 of the Birds Directive as it is used regularly by over 20,000 waterbirds.

- In the breeding season the area regularly supports 29,236 individual seabirds (count period ongoing), including black-headed gull, lesser black-backed gull and common tern.
- In the non-breeding season, the area regularly supports 323,861 individual waterbirds (5-year peak mean 1993/94 - 1997/98), including offshore ornithological features such as cormorant, common scoter and scaup.

5.6.2.45 The waders, geese and duck qualifying features of the SPA are typically associated with the intertidal estuary areas, rather than the offshore waters (with the exception of common scoter and scaup). Therefore, waders, geese and ducks (with the exception of common scoter and scaup) have been scoped out of further assessment for offshore impacts. Where appropriate, these species will be included in the intertidal ornithology assessment (Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES) and the Habitats Regulation Assessment Stage 2 Information to Support an Appropriate Assessment (document reference E2.1).

5.6.2.46 The offshore ornithological features of the Ribble & Alt Estuaries SPA where LSE could not be ruled out are cormorant, common scoter and scaup.

Morecambe Bay and Duddon Estuary SPA

5.6.2.47 The SPA extends between Rossall Point in Lancashire and Drigg Dunes in Cumbria. The site includes the former Morecambe Bay SPA and Duddon Estuary SPA and an extension to include the Ravenglass Estuary and

intervening coast and the shallow offshore area off south west Cumbria coast. It includes areas of adjoining terrestrial coastal habitat at North and South Walney and at Haverigg Point on the Duddon Estuary and the lagoons at South Walney; Cavendish Dock, Barrow and Hodbarrow, Haverigg. The SPA covers an area of 66,899.97 ha.

5.6.2.48 Morecambe Bay is the second largest embayment in Britain after The Wash, at over 310 km^2 and has four estuaries – the Wyre, Lune, Kent and Leven. It contains the largest continuous area of intertidal mudflats and sandflats in the UK which supports a variety of infaunal communities including cockle beds.

5.6.2.49 The site qualifies under article 4.1 of the Birds Directive as it is used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season.

- Non-breeding whooper swan, little egret *Egretta garzetta*, golden plover, bar-tailed godwit, ruff and Mediterranean gull *Larus melanocephalus*.
- Breeding little tern, sandwich tern and common tern.

5.6.2.50 The site qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season.

- Non-breeding pink-footed goose, shelduck, northern pintail, oystercatcher, grey plover, ringed plover, curlew *Numenius arquata*, black-tailed godwit, ruddy turnstone *Arenaria interpres*, red knot *Calidris canutus*, sanderling, dunlin, redshank and lesser black-backed gull.
- Breeding lesser black-backed gull and herring gull.

5.6.2.51 The SPA also qualifies under article 4.2 of the Birds Directive as it is used regularly by over 20,000 seabirds.

- At time of the 1997 citation of Morecambe Bay SPA, the area supported 40,672 individual seabirds including: herring gull, lesser black-backed gull, sandwich tern, common tern and little terns.

5.6.2.52 The SPA also qualifies under article 4.2 of the Birds Directive as it is used regularly by over 20,000 waterbirds.

- The main components of the assemblage include all of the qualifying features listed above, as well as an additional 19 species present in numbers exceeding 1% of the Great British total and/or exceeding 2,000 individuals: great white egret, spoonbill (*Platalea leucorodia*), light-bellied brent goose (Nearctic origin) *Branta bernicla*, wigeon, teal, green-winged teal, mallard, ring-necked duck, eider (non-breeding), goldeneye *Bucephala clangula*, red-breasted merganser, cormorant, lapwing, little stint *Calidris minuta*, spotted redshank *Tringa erythropus*, common greenshank, black-headed gull, common (mew) gull and herring gull (non-breeding).

5.6.2.53 The waders, geese and duck qualifying features of the SPA are typically associated with the intertidal estuary areas (except for eider), rather than the offshore waters. Therefore, waders, geese and ducks (except for eider) have

been scoped out of further assessment for offshore impacts. Where appropriate, these species will be included in the intertidal ornithology assessment (Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES) and the Habitats Regulation Assessment Stage 2 Information to Support an Appropriate Assessment (document reference E2.1).

5.6.2.54 The offshore ornithological features of the Morecambe Bay and Duddon Estuary SPA where LSE could not be ruled out are cormorant, eider and red-breasted merganser.

Morecambe Bay Ramsar site

5.6.2.55 Morecambe Bay Ramsar site lies between the coasts of south Cumbria and Lancashire and represents the largest continuous intertidal area in Britain. Morecambe Bay comprises the estuaries of five rivers and the accretion of mudflats behind Walney Island.

5.6.2.56 The Ramsar site is an area is of intertidal mud and sandflats, with associated saltmarshes, shingle beaches and other coastal habitats. It is a component in the chain of west coast estuaries of outstanding importance for passage and overwintering waterfowl (supporting the third-largest number of wintering waterfowl in Britain) and breeding waterfowl, gulls and terns.

5.6.2.57 Morecambe Bay Ramsar site was designated in 1996 and covers an area of 37,404 ha.

5.6.2.58 The Morecambe Bay Ramsar site is designated under Ramsar Criterion 6 for its:

- breeding population of lesser black-backed gull, herring gull and sandwich tern;
- spring/autumn passage populations of cormorant, shelduck, pintail, eider, oystercatcher, ringed plover, grey plover, sanderling, curlew, redshank, ruddy turnstone and lesser black-backed gull; and
- winter populations of great crested grebe *Podiceps cristatus*, pink-footed goose, wigeon, goldeneye, red-breasted merganser, golden plover, lapwing, red knot, dunlin and bar-tailed godwit.

5.6.2.59 The Ramsar site is also designated under Ramsar criterion 5 for supporting a wintering waterfowl assemblage of international importance (223,709 waterfowl based on a 5-year peak mean 1998/99-2002/2003) including internationally important numbers of passage ringed plover.

5.6.2.60 In addition, the Morecambe Bay Ramsar site citation also lists a number of noteworthy fauna species, with over 1% of the Great Britain population occurring within the Ramsar site during one of the seasons (breeding, spring/autumn passage and/or winter). This includes offshore ornithological features, such as breeding black-headed gull, spring/autumn passages of ruff, whimbrel, spotted redshank, greenshank, black-headed gull and wintering teal and black-tailed godwit.

5.6.2.61 The waders, geese and duck qualifying features of the Ramsar site are typically associated with the intertidal estuary areas, rather than the offshore waters (except for eider). Therefore, waders, geese and ducks (except for

eider) have been scoped out of further assessment for offshore impacts. Where appropriate, these species will be included in the intertidal ornithology assessment (Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES) and the Habitats Regulation Assessment Stage 2 Information to Support an Appropriate Assessment (document reference E2.1).

5.6.2.62 The offshore ornithological features of the Morecambe Bay Ramsar site where LSE could not be ruled out during the HRA screening are cormorant, eider and red-breasted merganser.

5.6.3 Site-specific surveys

5.6.3.1 No site-specific surveys of the Transmission Assets area have been undertaken; however, 24 months of surveys were undertaken for the Generation Assets which fall within the Offshore Order Limits: Morgan Offshore Wind Project: Generation Assets, between April 2021 and March 2023 and the Morecambe Offshore Windfarm: Generation Assets, between March 2021 and February 2023. The ES takes account of all available data for the Generation Assets representing 24 months of surveys (between April 2021 and March 2023 and between March 2021 and February 2023).

5.6.3.2 During the surveys of the Morgan Offshore Wind Project: Generation Assets, 17 species of seabird were recorded. These are listed in **Table 5.8** alongside a brief summary of the occurrence within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area (the Morgan Offshore Wind Project: Generation Assets plus a 10 km buffer) and distribution of each. Red-throated diver and common scoter, two qualifying features of the Liverpool Bay SPA were not recorded during baseline surveys of the Morgan Offshore Wind Project: Generation Assets.

Table 5.8: The occurrence and distribution of seabird species recorded during baseline aerial surveys of the Morgan Offshore Wind Project: Generation Assets

Species	Abundance and distribution
Kittiwake	Kittiwakes were recorded in all 24 months of the digital aerial surveys. Peak numbers occurred in the December 2021 survey. The species was most abundant in the post- and pre-breeding seasons of both survey years, especially December and at the start of the breeding season (March and April). The predicted abundance varied greatly for the rest of the breeding season (April to August) but was generally low between May to August and consistently much lower than post- and pre-breeding season months. There was an easterly bias in the distribution of kittiwake across the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area.
Little gull	Little gulls were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in three of the 24 months of the baseline aerial survey programme. The highest population occurred in January 2023 (159 birds) with birds also occurring in April 2021 (8 birds) and January 2022 (15 birds). Throughout the three surveys, birds were primarily located in the south half of the Morgan Offshore Wind Project: Generation Assets survey area.

Species	Abundance and distribution
Mediterranean gull	Mediterranean gulls were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in only one of the 24 months of the baseline aerial survey programme with this being in the January 2023 survey. One bird was observed in the south part of the Morgan Offshore Wind Project: Generation Assets survey area during the January 2023 survey translating into a population estimate of eight birds.
Common gull	Common gulls were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in eight of the 24 months of the baseline aerial survey programme. The highest population occurred in December 2022. Of the eight surveys in which the species was recorded, seven were during the non-breeding season, predominantly between November and January. The only records of birds in the breeding season came during the April 2022 survey. Due to the small number of birds recorded there were no obvious trends in the distribution of birds across the Morgan Offshore Wind Project: Generation Assets survey area.
Great black-backed gull	Great black-backed gulls were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in 10 of the 24 months of the baseline aerial survey programme. Peak numbers occurred in January 2022. The majority of birds were recorded in the non-breeding season defined for the species (September to March). In the breeding season birds were recorded in both August and March surveys. The populations of birds recorded during the non-breeding season were generally higher than those recorded in the breeding season. Birds were generally recorded in the south and east parts of the Morgan Offshore Wind Project: Generation Assets survey area.
Herring gull	Herring gulls were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in 14 of the 24 months of the baseline aerial survey programme. The highest populations were estimated in the non-breeding season defined for the species with the peak population occurring in January 2022. Small populations were recorded in breeding season months (less than 20 birds) with the exception of March 2023, when a population of 207 birds was estimated although this may reflect pre-breeding movements of birds. There was no obvious trend in the distribution of herring gull across the Morgan Offshore Wind Project: Generation Assets survey area.
Lesser black-backed gull	Lesser black-backed gulls were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in 11 of the 24 months of the baseline aerial survey programme. The highest populations were estimated in August or September likely reflecting dispersal/migratory movements of birds from breeding colonies. Smaller populations (less than 20 birds) were estimated in all other months.
Common tern	Common terns were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in only one of the 24 months of the baseline aerial survey programme. Six birds were observed in the south part of the Morgan Offshore Wind Project: Generation Assets survey area during the May 2021 survey translating into a population estimate of 59 birds.
Arctic tern	Arctic terns were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in only one of the 24 months of the baseline aerial survey programme. Three birds were observed in the south part of the Morgan Offshore Wind Project: Generation Assets survey area during the August 2022 survey translating into a population estimate of 63 birds.

Species	Abundance and distribution
Great skua	Great skuas were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in only one of the 24 months of the baseline aerial survey programme. One bird was observed on the south west boundary of the Morgan Offshore Wind Project: Generation Assets during the October 2022 survey translating into a population estimate of eight birds.
Arctic skua	Arctic skuas were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in only one of the 24 months of the baseline aerial survey programme. One bird was observed in the south west part of the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area during the September 2022 survey translating into a population estimate of seven birds.
Guillemot	Guillemots were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in all of the baseline aerial surveys. Populations were generally highest outside of the breeding season. The species was generally most abundant in the non-breeding season of both survey years, although the lowest populations estimated occurred in the November 2021 survey. The peak population occurred in August or September 2022 (depending on the calculation method used). In the breeding season of both survey years guillemot were distributed through the Morgan Offshore Wind Project: Generation Assets survey area. In the early part of the non-breeding season (August to December in 2021 and August and September in 2022) there appears to be an easterly bias in the modelled distribution of guillemot.
Razorbill	Razorbills were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in 19 of the 24 months of the baseline aerial survey programme. The highest populations were recorded outside of the breeding season, with very few birds observed between April and August in both years. The peak populations in both years occurred in the December surveys. There was an easterly bias in the distribution of razorbills across the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area.
Puffin	Puffins were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in four of the 24 months of the baseline aerial survey programme. Birds were recorded in April (19 birds) and May 2021 (18 birds), September 2022 (eight birds) and January 2023 (10 birds). Due to the limited numbers of birds recorded there is no obvious trend in the distribution of the species across the Morgan Offshore Wind Project: Generation Assets survey area.
Fulmar	Fulmars were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in 14 of the 24 months of the baseline aerial survey programme. The highest populations were estimated outside of the migration-free breeding season including in January 2022, when the peak population occurred and between November 2022 and March 2023. The distribution of the species within the Morgan Offshore Wind Project: Generation Assets survey area was generally focussed in north and west areas.
Manx shearwater	Manx shearwaters were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in 11 of the 24 months of the baseline aerial survey programme. Birds were observed between April and September 2021 and May and September 2022, reflecting the occurrence of the species in UK waters. The peak population in 2021 occurred in July and in September in 2022. No birds were recorded between October and March in both survey years reflecting the seasonal presence of Manx shearwater in UK waters.

Species	Abundance and distribution
Gannet	Gannets were recorded within the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in 22 of the 24 months of the baseline aerial survey programme. The highest populations occurred in both years towards the end of the breeding season into the post-breeding season with peak number in either August or September of both years. Outside of this period populations were generally lower and the species was absent in the Morgan Offshore Wind Project: Generation Assets offshore ornithology study area in the January and February 2023 surveys. The distribution of the species within the Morgan Offshore Wind Project: Generation Assets survey area was generally focussed in north and east areas.

5.6.3.3 During the surveys of the Morecambe Offshore Windfarm: Generation Assets, 22 species of seabird were recorded. These are listed in **Table 5.9** alongside a brief summary of the occurrence within the Morecambe Offshore Windfarm: Generation Assets offshore ornithology study area (the Morecambe Offshore Windfarm: Generation Assets plus a buffer extending to either 10 km for red-throated diver or 4 km for any other species) and distribution of each.

Table 5.9: The occurrence and distribution of seabird species recorded during baseline aerial surveys of the Morecambe Offshore Windfarm: Generation Assets

Species	Abundance and distribution
Common scoter	Common scoters were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 11 of the 24 months of the baseline aerial survey programme. The highest population occurred in December 2022. Of the eleven surveys in which the species was recorded, all were during the non-breeding season, predominantly between November and February. Common scoter were primarily distributed in the east side of the buffer consistent with the species presence in the Liverpool Bay SPA. In December 2022, relatively high densities were observed in the north east. In December 2022 and January 2023, birds were also recorded within the development area.
Kittiwake	Kittiwakes were recorded in all 24 months of the digital aerial surveys. Birds were observed in relatively low numbers throughout most of the non-breeding winter period with considerable increases in August and September 2021, and another, albeit more modest increase in September 2022. Birds were distributed throughout the survey area, with higher densities observed in the north of the development area and buffer between April and August 2021. In November 2021, increased densities were further observed in the west of the survey area. Kittiwake were more widespread across the survey area between March and September 2022, with greater densities observed towards the south east of the survey area in August and September 2022. During the second non-breeding season, the species was distributed evenly across the survey area.
Little gull	Little gulls were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 13 of the 24 months of the baseline aerial survey programme. Birds were recorded in relatively low numbers, with the highest population occurring in February 2023. No birds were recorded during the breeding season, consistent with the phenology of the species in UK waters. Across the surveys, the highest densities of birds were recorded in the north,

Species	Abundance and distribution
	west and east of the buffer area. In February 2023 little gull densities were distributed evenly across the survey area.
Common gull	Common gulls were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 18 of the 24 months of the baseline aerial survey programme. The highest population was estimated in December 2022. Of the 18 surveys in which the species was recorded, 12 were during the non-breeding season, predominantly between November and February. During the breeding season, very low numbers of birds were recorded in May 2021 and between March and August 2022, consistent with the breeding distribution of the species in the UK. Generally, birds were recorded within the buffer and distributed throughout the survey area, with higher densities in the north and east such as in March and December 2021, and November 2022.
Herring gull	Herring gulls were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in all 24 months of the baseline aerial survey programme. The highest populations were estimated in the non-breeding season defined for the species with the peak population occurring in December 2022. Small populations were recorded in breeding season months (less than 20 birds) with the exception of March 2021, May 2022 and July 2022, when populations of over 100 birds were estimated. There was no obvious trend in the distribution of herring gull across the Morecambe Project: Generation Assets offshore ornithology study area, with birds observed throughout the survey area, within the development area and buffer.
Lesser black-backed gull	Lesser black-backed gulls were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 21 of the 24 months of the baseline aerial survey programme in relatively low numbers throughout. The highest populations were estimated in August or September in both years, likely reflecting dispersal/migratory movements of birds from breeding colonies. Smaller populations (less than 20 birds) were estimated in all other months, with the exception of July 2022. There was no obvious trend in the distribution of lesser black-backed gull across the Morecambe Project: Generation Assets offshore ornithology study area, with birds observed throughout the survey area, within the development area and buffer.
Guillemot	Guillemots were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in all of the baseline aerial surveys. The species was generally most abundant in the non-breeding season of both survey years, although the lowest populations estimate occurred in December 2021. In the breeding season of both survey years guillemot were distributed throughout the Morecambe Project: Generation Assets offshore ornithology study area, with highest densities recorded in the north and east. Many birds were also distributed to the west and north west in November 2021 and March and April 2022. Between May and October 2022, guillemot were spread over the survey area with higher densities observed to the south east in November and December 2022.
Razorbill	Razorbills were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 22 of the 24 months of the baseline aerial survey programme. The largest populations were recorded outside of the breeding season. Very few birds were observed between June and September in both years, coinciding with the beginning of the post-breeding period. The peak population estimates across both years occurred in October 2021 and December 2022. There was no obvious trend in the distribution of razorbill across the Morecambe Project: Generation Assets offshore ornithology study area, with

Species	Abundance and distribution
	birds observed throughout the survey area, within the development area and buffer.
Red-throated diver	Red-throated divers were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 10 of the 24 months of the baseline aerial survey programme. Observations were intermittent and peaked in December 2021 and March 2022 during the non-breeding period, specifically the winter season and return migration season. Throughout the 24-month period, the majority of birds were primarily distributed in the east part of the survey area within the Liverpool SPA, with the exception of May 2022 where birds were recorded in the north and west of the buffer.
Manx shearwater	Manx shearwaters were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in eight of the 24 months of the baseline aerial survey programme. Birds were observed in relatively high numbers in July and August 2021 and May and September 2022. The peak population in 2021 occurred in July and in May in 2022. No birds were recorded between October and April in both survey years reflecting the seasonal presence of Manx shearwater in UK waters. Birds were distributed throughout the survey area, with high densities recorded in the centre of the survey area and within the development area.
Gannet	Gannets were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 18 of the 24 months of the baseline aerial survey programme. Birds were recorded in relatively high numbers in some breeding season months, with intermittent observations occurring during the non-breeding period. The highest populations occurred in 2021 towards the end of the breeding season into the post-breeding season with peak numbers in August 2021. In 2022, lower numbers of birds were observed than in 2021, with observations more evenly distributed between May and September, with peak observations in May 2022. The distribution of the species within the Morecambe Project: Generation Assets offshore ornithology study area was generally widespread, with south westerly trends in months September to November 2021 and March to July 2022.
Great black-backed gull	Great black-backed gulls were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 20 of the 24 months of the baseline aerial survey programme. Peak numbers occurred in May 2022. Observations throughout the surveys were intermittent and occurred during the breeding and non-breeding periods, although populations of birds recorded during the non-breeding season were higher than those recorded in the breeding season. Birds were generally distributed across the north buffer of the survey area.
Puffin	Puffins were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 11 of the 24 months of the baseline aerial survey programme. The majority of puffins were recorded in July 2021, during the breeding season. Birds were distributed in the north and east buffer of the survey area, and within the development area.
Fulmar	Fulmar were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in 13 of the 24 months of the baseline aerial survey programme. A total of 73 birds were observed across the survey period. There was no obvious trend in the distribution of fulmar across the Morecambe Project: Generation Assets offshore ornithology study area, with birds observed throughout the survey area, within the development area and buffer.

Species	Abundance and distribution
Sandwich tern	Sandwich terns were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in eight of the 24 months of the baseline aerial survey programme. Birds were recorded in relatively moderate numbers at the end of the breeding season, in September 2021, with fewer birds recorded during the second year of surveys. Birds were generally observed to the east of the survey area in the buffer within the Liverpool Bay SPA.
Arctic tern	Arctic terns were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in four of the 24 months of the baseline aerial survey programme. Observations peaked in May 2022 with 49 individuals, with the majority of birds recorded within the development area. In other months, birds were generally observed in the north and east of the buffer.
Shag	Shags were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in three of the 24 months of the baseline aerial survey programme. Relatively few birds were recorded, and observations were distributed across the Morecambe Project: Generation Assets offshore ornithology study area.
Black-headed gull	Black-headed gulls were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in five of the 24 months of the baseline aerial survey programme. Due to the limited numbers of birds recorded there is no obvious trend in the distribution of the species across the Morecambe Project: Generation Assets offshore ornithology study area, but birds generally tended to be recorded in the east buffer and development area.
Arctic skua	Arctic skuas were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in only one of the 24 months of the baseline aerial survey programme. One bird was observed in the north west part of the Morecambe Project: Generation Assets offshore ornithology study area during the September 2022. Due to the limited numbers of birds recorded there is no obvious trend in the distribution of the species across the Morecambe Project: Generation Assets offshore ornithology study area.
Common tern	Common terns were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in six of the 24 months of the baseline aerial survey programme. The species was recorded in June, August, and September 2021, and April, May and September 2022. Due to the limited numbers of birds recorded there is no obvious trend in the distribution of the species across the Morecambe Project: Generation Assets offshore ornithology study area.
Cormorant	Cormorants were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in three of the 24 months of the baseline aerial survey programme. Relatively few birds were recorded in May, June and August 2021. No birds were recorded in 2022. Due to the limited numbers of birds recorded there is no obvious trend in the distribution of the species across the Morecambe Project: Generation Assets offshore ornithology study area.
Great skua	Great skuas were recorded within the Morecambe Project: Generation Assets offshore ornithology study area in only one of the 24 months of the baseline aerial survey programme. One bird was observed on the west boundary of the Morecambe Project: Generation Assets during the May 2021 survey. Due to the limited numbers of birds recorded there is no obvious trend in the distribution of the species across the Morecambe Project: Generation Assets offshore ornithology study area.

5.6.4 Future baseline conditions

5.6.4.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires that 'an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge' is included within the ES. This section provides an outline of the likely future baseline conditions in the absence of the Transmission Assets.

5.6.4.2 The UK holds internationally important populations of seabirds (Mitchell *et al.*, 2004). UK seabird populations have shown a marked decline over the last two decades (JNCC, 2020; Mitchell *et al.*, 2020) with over a third of species experiencing declines in breeding abundance of up to 30% or more since the early 1990s (Mitchell *et al.*, 2020).

5.6.4.3 A recent study suggests that, in terms of number of species affected and the average impact, the key three threats to seabird populations globally are invasive species (165 species across all the most threatened groups), bycatch in fisheries (100 species but with the greatest average impact) and climate change (96 species affected) (Dias *et al.*, 2019 and Mitchell *et al.*, 2020).

5.6.4.4 Most seabird species in the UK are at the south limit of their range in the north east Atlantic and therefore an increase in global temperatures could result in a shift in species' range with the potential for overall declines in population size (Frederiksen *et al.*, 2007, 2013 and Mitchell *et al.*, 2020). In the UK and Ireland, climate change is considered to be the likely primary cause of decline in seabird populations in the future, with anticipated depletion of breeding conditions for most species either indirectly, through changes in prey abundance, or directly during extreme weather events (Mitchell *et al.*, 2020).

5.6.4.5 Fisheries management will also likely impact on future seabird populations in the UK and Ireland. For many years, seabird species have benefitted from bycatch and fisheries discards; for scavenging species such as European herring gull, black-legged kittiwake, great skua and fulmar, population levels may already be above those that naturally occurring food sources would sustain (Votier *et al.*, 2004 and Frederiksen *et al.*, 2013). However, the introduction between 2015 and 2019 of the Common Fisheries Policy Landings Obligation ('discard ban') will likely reduce the discard available and ultimately put more pressure on scavenging species.

5.6.5 Key receptors

5.6.5.1 The receptors included within the assessment are:

- species identified in the desktop study review (**section 5.6.1**);
- species recorded during the Morgan Offshore Wind Project: Generation Assets baseline aerial surveys (**Table 5.8**) and/or the Morecambe Offshore Windfarm: Generation Assets baseline aerial surveys in more than negligible numbers (**Table 5.9**); and

- qualifying offshore ornithological features of European sites with LSEs as set out in **Table 5.7** above (Liverpool Bay SPA, Ribble & Alt Estuaries SPA and Ramsar site, Morecambe Bay and Duddon Estuary SPA and Morecambe Bay Ramsar site) and additional qualifying offshore ornithological features of Liverpool Bay SPA, Ribble & Alt Estuaries SPA and Ramsar site (as the Offshore Order Limits falls within these sites) for which LSE could not be ruled out during the HRA Stage 1 Screening Report for the Transmission Assets.

5.6.5.2 **Table 5.10** identifies the offshore ornithology receptors taken forward into the assessment and agreed with stakeholders through the consultation process, as presented in **section 5.3**. The receptors have been selected based on the presence of each species within the study area. Where the abundance of a species is more than negligible in either site-specific surveys or regional datasets then the species is identified as a receptor.

5.6.5.3 The conservation status of each offshore ornithological receptor, their vulnerability to impact (for each impact which has been scoped in for the assessment) and their recoverability are identified in **Table 5.11** and **Table 5.12**.

5.6.5.4 The conservation status of each identified receptor has been determined based on the following.

- Annex I of the European Commission Directive 2009/147/EC (codified version of 79/409/EC) on the Conservation of Wild Birds (the 'Birds Directive'). Within the UK, the Conservation of Habitats and Species Regulations 2017 (as amended) transpose aspects of the Birds Directive into national law, covering all environments out to 12 nm. The Conservation of Habitats and Species Regulations 2017 were amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, but still remain the core legislation.
- Birds of Conservation Concern (BoCC) (Stanbury *et al.*, 2021), which uses quantitative assessments against standardised criteria to allocate species to Red, Amber or Green lists depending on their level of conservation concern.
- BoCC in the Isle of Man (Morris and Sharpe, 2021), which uses quantitative assessments against standardised criteria to allocate species in the Isle of Man to Red, Amber or Green lists depending on their level of conservation concern.
- Species of principal importance (SPI) for the conservation of biodiversity in England (priority species) were included in the assessment as listed under Section 41 of the Natural Environment and Rural Communities Act 2006.

5.6.5.5 The vulnerability of each species to the impacts associated with the Transmission Assets is identified in **Table 5.11** using information from Wade *et al.* (2016) or Bradbury *et al.* (2014).

5.6.5.6 The assessment of ornithological recoverability considers the ability of species' populations to return to their former status once background conditions return (i.e. when the effects of a particular impact cease, e.g. upon

completion of the construction phase, or as birds habituate to an impact). It is thus important to evaluate the nature of the impact in terms of the duration required for recoverability, which is a factor of a species' natural productivity rate and background population trend in the absence of the impact.

5.6.5.7 Species with the potential to produce many young per year are considered to be able to recover more rapidly and hence to be at less risk than species that produce fewer young per year. This was determined using information on clutch size (average clutch size and maximum clutch size) and age at first breeding (Robinson, 2017). Species such as fulmar, gannet and guillemot that lay only one egg each year and do not breed until they are several years old, have the lowest recoverability. Conversely, sea duck have large clutches and usually commence breeding at two or three years of age and so recoverability would be higher.

5.6.5.8 The second factor for recoverability is a species' population status (e.g. stable, declining) of, for example, a regional breeding population, or during winter months for a national or flyway population.

5.6.5.9 Regional breeding status has been determined by comparing the trend in the populations of breeding colonies within the Irish Sea as presented in JNCC (2021). Where regional trends are unavailable national trends are used with these, also sourced from JNCC (2021). Where a species is of primary concern in the non-breeding season the national population trend has been identified by comparing the national populations presented in Musgrove *et al.* (2013) and Woodward *et al.* (2020). This approach has also been used for breeding Manx shearwater for which a trend is not available in JNCC (2021).

5.6.5.10 Using these trends, the recoverability of a population can be determined. It was considered that a significantly increasing population (>25% increase) has a high recoverability, with a stable population (<25% change) rated medium and a declining population (>25% decrease) rated as having a low recoverability (excluding differences in reproductive rate). In exceptional circumstances where the species' population would be at risk of extinction, there may be no ability for recovery. No trend data is available for little gull. However, little gull is Green Listed BoCC and therefore the population is thought to be stable and the recoverability for this species has therefore been defined as medium.

Table 5.10: Key receptors taken forward to assessment

Species	Presence in site-specific surveys		Presence in regional datasets	Feature of nearby designated site with potential connectivity?	LSE identified in HRA Stage 1 screening report	Receptor taken forward to assessment?	Justification
	Morgan	Morecambe					
Scaup	Not present	Not present	Not present	Yes	Yes	Yes	Qualifying feature of nearby SPA. LSE identified during HRA screening
Eider	Not present	Not present	Low densities	Yes	Yes	Yes	Qualifying feature of nearby SPA. LSE identified during HRA screening. Recorded in more than negligible numbers in regional datasets
Common scoter	Not present	Present	Not present	Yes	Yes	Yes	Qualifying feature of nearby SPA with distribution overlapping study area. LSE identified during HRA screening
Red-breasted merganser	Not present	Not present	Not included	Yes	No	Yes	Qualifying feature of nearby SPA.

Species	Presence in site-specific surveys		Presence in regional datasets	Feature of nearby designated site with potential connectivity?	LSE identified in HRA Stage 1 screening report	Receptor taken forward to assessment?	Justification
	Morgan	Morecambe					
Kittiwake	Present	Present	Low densities within study area	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets
Black-headed gull	Not present	Limited	Low densities within study area	No	No	Yes	Recorded in more than negligible numbers in regional datasets
Little gull	Present	Present	Not present	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys
Mediterranean gull	Limited	Not present	Not present	No	No	No	Species only present in limited numbers, no SPA connectivity
Common gull	Present	Present	Densities relatively high in non-breeding season	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys. Relatively high densities in regional datasets

Species	Presence in site-specific surveys		Presence in regional datasets	Feature of nearby designated site with potential connectivity?	LSE identified in HRA Stage 1 screening report	Receptor taken forward to assessment?	Justification
	Morgan	Morecambe					
Great black-backed gull	Present	Present	Relative moderate density area overlaps with study area	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets
Herring gull	Present	Present	Low densities	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets
Lesser black-backed gull	Present	Present	Small area of high density overlaps with study area in non-breeding season	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets
Sandwich tern	Not present	Limited	Low densities present in the breeding season	No	No	No	Species only present in limited numbers, no SPA connectivity
Little tern	Not present	Not present	Not present	No	No	No	Not present in study area
Common tern	Limited	Limited	Not present	No	No	No	Species only present in limited numbers, no SPA connectivity

Species	Presence in site-specific surveys		Presence in regional datasets	Feature of nearby designated site with potential connectivity?	LSE identified in HRA Stage 1 screening report	Receptor taken forward to assessment?	Justification
	Morgan	Morecambe					
Arctic tern	Limited	Limited	Not present	No	No	No	Species only present in limited numbers, no SPA connectivity
Great skua	Limited	Limited	Not present	No	No	No	Species only present in limited numbers, no SPA connectivity
Arctic skua	Limited	Limited	Not present	No	No	No	Species only present in limited numbers, no SPA connectivity
Guillemot	Present	Present	Moderate densities close to or within study area	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets
Razorbill	Present	Present	Low densities present in the non-breeding season	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets

Species	Presence in site-specific surveys		Presence in regional datasets	Feature of nearby designated site with potential connectivity?	LSE identified in HRA Stage 1 screening report	Receptor taken forward to assessment?	Justification
	Morgan	Morecambe					
Puffin	Present	Present	Very low densities across all months	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys
Red-throated diver	Not present	Present	Low densities present in the non-breeding season	Yes	Yes	Yes	Qualifying feature of nearby SPA. LSE identified during HRA screening. Recorded in more than negligible numbers in regional datasets
Black-throated diver	Not present	Not present	Not included	No	No	No	Not present in study area
Storm petrel	Not present	Not present	Not present	No	No	No	Not present in study area
Fulmar	Present	Limited	Low densities increasing as distance offshore increases	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets

Species	Presence in site-specific surveys		Presence in regional datasets	Feature of nearby designated site with potential connectivity?	LSE identified in HRA Stage 1 screening report	Receptor taken forward to assessment?	Justification
	Morgan	Morecambe					
Manx shearwater	Present	Present	Low densities across all months	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets
Gannet	Present	Present	Relatively high densities recorded close to study area	No	No	Yes	Recorded in more than negligible numbers during site-specific surveys and in regional datasets
Cormorant	Not present	Limited	Limited coastal presence throughout the year	Yes	Yes	Yes	Qualifying feature of nearby SPA. LSE identified during HRA screening
Shag	Not present	Limited	Not included	No	No	No	Species only present in limited numbers

Table 5.11: Conservation importance and vulnerability (Wade *et al.,* 2016; Bradbury *et al.,* 2014) of offshore ornithological receptors

Receptor	Conservation status	Sensitivity to displacement by vessels and helicopters	Habitat flexibility (note that a low habitat flexibility indicates a high vulnerability)
Scaup	Red List, SPA feature, SPI	4 (High)	4 (Low)
Eider	Amber List, SPA feature	3 (Medium)	4 (Low)
Common scoter	Red List, SPA feature, SPI	5 (Very high)	4 (Low)
Red-breasted merganser	Amber List, SPA feature	3 (Medium)	4 (Low)
Kittiwake	Red List	2 (Low)	2 (Medium)
Black-headed gull	Amber List, SPA feature	2 (Low)	2 (Medium)
Little gull	Annex I, SPA feature	1 (Very low)	3 (Medium)
Common gull	Amber List	2 (Low)	2 (Medium)
Great black-backed gull	Amber List	1 (Very low)	2 (Medium)
Herring gull	Red List, SPA feature, SPI	1 (Very low)	1 (High)
Lesser black-backed gull	Amber List, SPA feature	1 (Very low)	1 (High)
Guillemot	Amber List	3 (Medium)	3 (Medium)
Razorbill	Amber List	3 (Medium)	3 (Medium)
Puffin	Red List	3 (Medium)	3 (Medium)

Receptor	Conservation status	Sensitivity to displacement by vessels and helicopters	Habitat flexibility (note that a low habitat flexibility indicates a high vulnerability)
Red-throated diver	Annex I , SPA feature	5 (Very high)	4 (Low)
Fulmar	Amber List	1 (Very low)	1 (High)
Manx shearwater	Amber List	1 (Very low)	1 (High)
Gannet	Amber List	1 (Very low)	1 (High)
Cormorant	Green List, SPA feature	4 (High)	3 (Medium)

Table 5.12: Recoverability of offshore ornithological receptors populations

Receptor	Clutch size (no. of eggs)[a]	Age at first breeding	Season of relevance for population trends	Regional trend (%) [e]	National trend (breeding season) (%)		National trend (non-breeding season, unless otherwise stated) (%)			Overall recoverability
					1985-88 to 1998-2002 [d]	2000 to 2019 [d]	25-year trend [h]	10-year trend [c]	APEP 3 to APEP 4 [g]	
Scaup	8-11	2	Non-breeding	Not available	-	-	- 92	- 36	Decreasing	Low
Eider	4-6	3	Non-breeding	Not available	-	-	- 49	- 44	Increasing	High
Common scoter	6-8	2	Non-breeding	Not available	-	-	Not available	Not available	Increasing	High
Red-breasted merganser	8-10	3 [b]	Non-breeding	Not available	-	-	- 47	- 35	Increasing	Medium
Kittiwake	2	4	Breeding	- 82 to - 19	- 25	- 29	-	-	-	Low
Black-headed gull	2-3	2	Breeding	Not available	0	+ 26	-	-	-	High
Little gull	2-3	2-3	Non-breeding	Not available	-	-	Not available	Not available	Not available	Medium
Common gull	3	3	Non-breeding	Not available	-	-	Not available	Not available	Not available	High
Great black-backed gull	2-3	4	Breeding	Not available	- 4	- 23	-	-	-	Medium
Herring gull	3	4	Breeding	Not available	- 13	Not available	-	-	-	Medium

Receptor	Clutch size (no. of eggs)[a]	Age at first breeding	Season of relevance for population trends	Regional trend (%) [e]	National trend (breeding season) (%)		National trend (non-breeding season, unless otherwise stated) (%)			Overall recoverability
					1985-88 to 1998-2002 [d]	2000 to 2019 [d]	25-year trend [h]	10-year trend [c]	APEP 3 to APEP 4 [g]	
Lesser black-backed gull	3	4	Breeding	Not available	+ 40	Not available	-	-	-	High
Guillemot	1	5	Breeding	- 34 to + 120	+ 31	+ 60	-	-	-	High
Razorbill	1	4	Breeding	+ 10 to + 91	+ 21	+37	-	-	-	High
Puffin	1	5	Breeding	Not available	+ 19	Not available	-	-	-	Medium
Red-throated diver	2	3	Non-breeding	Not available	-	-	Not available	Not available	Increasing	High
Fulmar	1	9	Breeding	- 36	- 3	- 33	-	-	-	Low
Manx shearwater	1	5	Breeding	Not available	Not available	Not available	-	-	Stable (breeding)	Medium
Gannet	1	5	Breeding	- 1 to + 22	+ 39	+ 34	-	-		High
Cormorant	3-4	3	Breeding	Not available	+ 10	+ 16	-	-	-	Medium

Receptor	Clutch size (no. of eggs)[a]	Age at first breeding	Season of relevance for population trends	Regional trend (%) [e]	National trend (breeding season) (%)		National trend (non-breeding season, unless otherwise stated) (%)			Overall recoverability
					1985-88 to 1998-2002 [d]	2000 to 2019 [d]	25-year trend [h]	10-year trend [c]	APEP 3 to APEP 4 [g]	

References

a – BTO Birdfacts (2023)

b – Gregory *et al.* (1997)

c – Non-breeding season trend for England from Austin *et al.* (2023)

d – JNCC (2021)

e – Trend for Irish Sea colonies from JNCC (2021)

f – Lawson *et al.* (2016)

g – Musgrove *et al.* (2013) and Woodward *et al.* (2020) APEP stands for Avian Population Estimates Panel, a collaboration between the UK statutory conservation agencies and relevant non- governmental organisations.

5.7 Scope of the assessment

5.7.1.1 The scope of this ES has been developed in consultation with relevant statutory and non-statutory consultees as detailed in **Table 5.3**. The assessment has considered all potential impacts on offshore ornithological receptors occurring during the construction, operation and maintenance, and decommissioning phases of the export cable up to MLWS.

5.7.1.2 Taking into account the scoping and consultation process, **Table 5.13** summarises the potential effects considered as part of this assessment.

Table 5.13: Impacts scoped into the assessment

Activity	Impacts scoped into the assessment
Construction phase	
Installation of assets: • pre-construction site investigation surveys, which are likely to include geophysical and geotechnical surveys; • unexploded ordnance (UXO) surveys and possible UXO removal; • boulder clearance; • installation of cables (trench excavations); and • presence of vessels and possibly helicopters.	Disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure. Indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species. Temporary habitat loss/disturbance and increased SSCs.
Operation and maintenance	
Occasional, localised and short-term operations and maintenance activities	Disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure. Temporary habitat loss/disturbance and increased SSCs. Indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species.
Decommissioning	
Removal of assets	Disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure. Indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species. Temporary habitat loss/disturbance and increased SSCs.

5.7.1.3 Impacts that are not likely to be significant have been scoped out of the assessment. A summary of the impacts scoped out, together with justification for scoping them out and whether the approach has been agreed with key stakeholders through either scoping or consultation, is presented in **Table 5.14**.

Table 5.14: Impacts scoped out of the assessment

Impacts	Justification
Accidental pollution during construction, operations and maintenance and decommissioning phases	Pollution impacts (accidental oil/fuel spills) during all phases of the Transmission Assets are scoped out on the basis that the implementation of a Marine Pollution Contingency Plan will avoid the risk of significant pollution events. Consequently, seabirds and other waterbirds are extremely unlikely to be significantly affected by any such pollution impacts. As such, no significant effects would occur and this is scoped out of the EIA process. This was agreed by the Planning Inspectorate, as set out in **Table 5.3.**
Collision risk during the operation and maintenance phase.	Stationary OSPs and offshore booster station structures are no longer included in the project design and therefore there is no potential for collision of birds to occur with the Transmission Assets.
Barrier to movement during the operation and maintenance phase.	Stationary OSPs and offshore booster station structures are no longer included in the project design and therefore there is no potential for barrier effects to occur as a result of the presence of the Transmission Assets.

5.8 Measures adopted as part of the Transmission Assets (Commitments)

5.8.1.1 For the purposes of the EIA process, the term 'measures adopted as part of the Transmission Assets' is used to include the following two types of mitigation measures (adapted from Institute for Environmental Management and Assessment (IEMA), 2016). These measures are set out in Volume 1, Annex 5.3: Commitments register of the ES.

- Embedded mitigation. This includes the following.
  - Primary (inherent) mitigation - measures included as part of the project design. IEMA describes these as 'modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project and do not require additional action to be taken'. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the project and the parameters secured in the DCO and/or marine licences. For example, a reduction in footprint or height.
  - Tertiary (inexorable) mitigation. IEMA describes these as 'actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects'. It may be helpful to secure such measures through a Code of Construction Practice or similar.
- Secondary (foreseeable) mitigation. IEMA describes these as '*actions that will require further activity in order to achieve the anticipated outcome'*. These include measures required to reduce the significance of environmental effects (such as lighting limits) and may be secured through an Environmental Management Plan (EMP).

5.8.1.2 All measures are clearly identified within Volume 1, Annex 5.3: Commitments register of the ES. The measures relevant to this chapter are summarised in **Table 5.15**.

5.8.1.3 Embedded measures that will form part of the final design (and/or are established legislative requirements/good practice) have been taken into account as part of the initial assessment presented in **section 5.11** below (i.e., the initial determination of impact magnitude and significance of effects assumes implementation of these measures). This ensures that the measures that the Applicants are committed to are taken into account in the assessment of effects.

5.8.1.4 Where an assessment identifies likely significant adverse effects, further or secondary mitigation measures may be applied. These are measures that could further prevent, reduce and, where possible, offset these effects. They are defined by IEMA as actions that will require further activity in order to achieve the anticipated outcome and may be imposed as part of the planning consent, or through inclusion in the ES (referred to as secondary mitigation

measures in IEMA, 2016). For further or secondary measures both pre-mitigation and residual effects are presented.

Table 5.15: Measures (commitments) adopted as part of the Transmission Assets.

Commitment number	Measure adopted	How the measure will be secured
Embedded measures		
CoT49	Construction Method Statement(s) (CMSs) including Offshore Cable Specification and Installation Plan(s), will be produced and implemented prior to construction. These will contain: - details of cable installation and methodology; and - details of foundation installation methodology covering scour protection and the deposition of material arising from drilling, dredging, and/or sandwave clearance.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation).
CoT55	Offshore Decommissioning Programme(s) will be developed prior to decommissioning and will include information on the consideration of recycling of materials, where practicable, and if opportunities are available.	DCO Schedule 2A Requirement 21 (Offshore decommissioning) and DCO Schedule 2B Requirement 21 (Offshore decommissioning).
CoT65	Offshore Environmental Management Plan(s) (EMPs) will be developed and will include details of: – a marine pollution contingency plan to address the risks, methods and procedures to deal with any spills and collision incidents during construction and operation of the authorised scheme for activities carried out below MHWS; – a chemical risk review to include information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance; – waste management and disposal arrangements; – the appointment and responsibilities of a fisheries liaison officer; – a fisheries liaison and coexistence plan (which accords with the outline fisheries liaison and co-existence plan) to ensure relevant fishing fleets are notified of commencement of licensed activities pursuant to condition and to address the interaction of the licensed activities with fishing activities; – measures to minimise disturbance to marine mammals and rafting birds from vessels; and	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(f) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(f) (Pre-construction plans and documentation).

Commitment number	Measure adopted	How the measure will be secured
	– measures to minimise the potential spread of invasive non-native species, including adherence to IMO ballast water management guidelines.	
CoT69	Detailed Vessel Traffic Management Plan(s) (VTMP) will be developed pre-construction in line with legislation, guidance and industry best practice which will: – determine vessel routing to and from construction areas and ports; – include vessel standards and a code of conduct for vessel operators; and – minimise, as far as reasonably practicable, encounters with marine mammals and basking sharks. – These plans will be developed in accordance with the Outline VTMP prepared and submitted with the application for development consent.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(h) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(h) (Pre-construction plans and documentation).
CoT110	Construction activities associated with the offshore cable pull in for the Morgan Offshore Wind Project and Morecambe Offshore Windfarm Limited will be undertaken in accordance with the Outline Offshore Cable Specification and Installation Plan (CSIP). This will restrict the Applicants to completing one cable pull in (a maximum of five weeks) per wintering season (i.e. during the months of November – February, inclusive), unless otherwise agreed with the MMO, in consultation with Natural England. Detailed CSIP(s) will be developed in accordance with the Outline CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(e) (Pre-construction plans and documentation).
CoT111	The total number of vessels for both the Morgan Offshore Wind Project and Morecambe Offshore Windfarm Limited actively working within the Liverpool Bay/Bae Lerpwl SPA during construction or during operation and maintenance phase will be limited to a maximum of five vessels at any one time in the wintering period, i.e. between November and February (inclusive). This will be included within the Offshore Environmental Management Plan(s)'s measures to minimise disturbance to marine mammals and rafting birds from vessels.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition 18(1)(f) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 – 18(1)(f) (Pre-construction plans and documentation).
CoT113	Where construction activities are undertaken within the Intertidal Infrastructure Area, mitigation measures will be provided at Fairhaven saltmarsh to reduce disturbance upon roosting wader features of Ribble and Alt Estuary SPA. This may comprise a combination of the employment of a warden, educational signage, and soft fencing. This is detailed within the Outline Ecological Management Plan.	DCO Schedules 2A & 2B, Requirement 12 (Ecological management plan).

Commitment number	Measure adopted	How the measure will be secured
CoT114	All permanent infrastructure located between Mean Low Water Springs (MLWS) and Mean High Water Springs (MHWS) will be buried to a target depth of 3 metres, subject to further pre-construction surveys to be reported within Detailed Cable Burial Risk Assessments (CBRAs). An Outline CBRA has been prepared and submitted with the application for development consent.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition18(1)(e)(i)(bb) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(e)(i)(bb) (Pre-construction plans and documentation).
CoT115	An Offshore In-Principal Monitoring Plan (OIPMP) has been prepared and submitted as part of the application for development consent. The OIPMP includes for monitoring of the recovery of sediments and benthic communities within representative areas of the Fylde MCZ potentially impacted by sandwave clearance, cable installation and cable protection, at appropriate temporal intervals as part of the operational asset integrity surveys. Detailed Offshore Monitoring Plans will be produced prior to operation and maintenance phases in accordance with the OIPMP and will be approved in consultation with statutory advisors and regulators.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(d) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(d) (Pre-construction plans and documentation).
CoT116	Any material arising from sandwave clearance within the Transmission Assets Order Limits will be deposited in close proximity to the works and within the licensed disposal sites within the Order Limits, as detailed in the Dredging and Disposal - Site Characterisation Plan prepared and submitted as part of the application for development consent.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 1 - Condition 2(f) (Design Parameters) and Part 2 – Condition16(4) (Chemicals, drilling and debris); and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets) Part 1 - Condition 2(f) (Design Parameters) and Part 2 – Condition16(4) (Chemicals, drilling and debris).

5.9 Key parameters for assessment

5.9.1 Maximum design scenario

5.9.1.1 The construction scenario laid out within the MDS in **Table 5.16** and assessed within the assessment of effects in **section 5.11** considers activities to be carried out sequentially (i.e. 30 month total duration with a possible gap between construction of Morecambe and Morgan cables), as this is considered to represent the worst case scenario as it is associated with the greatest temporal scale across which impacts may occur.

5.9.1.2 The MDS has been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g., different infrastructure layout), to that assessed here be taken forward in the final design.

Table 5.16: Maximum design scenario considered for the assessment of impacts

Impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure	✓	✓	✓	**Pre-Construction and Construction phase** Overview Disturbance during pre-construction due to: • pre-construction site investigation surveys, which are likely to include geophysical and geotechnical surveys; • pre-construction UXO surveys and possible UXO removal; Site Preparation and installation of up to 484 km of offshore export cables. Offshore site preparation and construction works anticipated to occur across a 30 month period (sequential construction) noting that there is potential for a gap between the construction periods for Morgan and Morecambe. Disturbance during construction due to: • site preparation boulder clearance; • installation of cables (may involve drilling, trench excavations); and • presence of vessels and possibly helicopters. Pre-construction • Clearance of up to 25 UXOs within the Offshore Order Limits (22 for the Morgan Offshore Wind Project: Transmission Assets and 3 for the Morecambe Offshore Windfarm: Transmission Assets). • A range of UXO sizes assessed from 25 kg up to 907 kg with 130 kg the most likely maximum. • For high order detonation donor charges of 1.2 kg (most common) and 3.5 kg (single barracuda blast charge). • Up to 0.5 kg Net Explosive Quantity clearance shot for neutralisation of residual explosive material at each location. • Clearance during daylight hours only. The MDS is for high order clearance but assessment also considered:	*UXO Clearance:* The MDS is based upon the maximum number and maximum size of UXOs potentially encountered within the Transmission Assets and is based upon high order clearance. Due to uncertainties in size of UXOs, the assessment presents a range of sizes, highlighting the most likely size to be encountered. *Vessels* The MDS considers the maximum number of vessels on site at any one time and greatest number of round trips during each project phase. This represents the broadest range of vessel types and therefore noise signatures within the marine environment to affect offshore ornithology receptors. The sequential construction scenario is included as the maximum design scenario as this results in the longest duration of impact.

Impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		

				• Low order clearance charge size of 0.08 kg.
				• Low yield clearance configurations of 0.75 kg charges (up to 4x0.75 kg).
				
				<u>MDS: Construction vessels and helicopters</u>
				• Vessels on site.
				  • Morgan Offshore Wind Project: Transmission Assets:
				  – Up to a total of 19 construction vessels on site at any one time (two tug/anchor handlers, six cable lay installation and support vessels, one guard vessel, two survey vessels, four seabed preparation vessels, two Crew Transfer Vessels (CTV) and two cable protection installation vessels).
				  • Morecambe Offshore Windfarm: Transmission Assets:
				  – Up to a total of 11 construction vessels on site at any one time (one tug/anchor handlers, four cable lay installation and support vessels, one guard vessel, one survey vessels, two seabed preparation vessels, one CTVs and one cable protection installation vessels).
				• Vessel movements.
				  • Morgan Offshore Wind Project: Transmission Assets:
				  – Up to 286 installation vessel movements (return trips) during construction (8 movements for tug/anchor handlers, 40 movements for cable lay installation and support vessels, 18 movements for guard vessels, four movements for survey vessels, 16 movements for seabed preparation vessels, 120 movements for CTVs and 20 movements for cable protection installation vessels).
				  • Morecambe Offshore Windfarm: Transmission Assets:
				  – Up to 60 installation vessel movements (return trips) during construction (four movements for tug/anchor handlers, eight movements for cable lay installation and support vessels, 12 movements for guard vessels, two movements for survey vessels, four	

Impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				movements for seabed preparation vessels, 28 movements for CTVs and two movements for cable protection installation vessels). • Helicopters (Morgan only). – Up to a total of one helicopter and 20 flights. **Operation and maintenance phase** • Vessels on site. • Morgan Offshore Wind Project: Transmission Assets: – Up to eight operation and maintenance vessels on site at any one time (two CTVs/workboats, one jack-up vessels, one cable repair vessels, two Service Operation Vessels (SOV) or similar and two excavators/backhoe dredgers). • Morecambe Offshore Windfarm: Transmission Assets: – Up to six operation and maintenance vessels on site at any one time (two CTVs/workboats, one jack-up vessels, one cable repair vessels, one SOVs or similar and one excavators/backhoe dredgers). • Vessel movements. • Morgan Offshore Wind Project: Transmission Assets: – Up to 52 operation and maintenance vessel movements (return trips) each year (28 movements for CTVs/workboats, two movements for jack-up vessels, two movements for cable repair vessels, 16 movements for SOVs or similar and four movements for excavators/backhoe dredgers). • Morecambe Offshore Windfarm: Transmission Assets: – Up to 25 operation and maintenance vessels on site at any one time (14 movements for CTVs/workboats, one movement for jack-up vessels, two movements for cable repair vessels, four movements for SOVs or similar and four movements for excavators/backhoe dredgers).	

Impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				• Helicopters (Morgan only). – Up to a maximum of two helicopters at any one time. – Total of 16 helicopter movements associated with the Transmission Assets. **Decommissioning phase.** Anticipated to be similar to construction disturbance activities.	
Temporary habitat loss/disturbance and increased SSCs	✓	✓	✓	**Pre-Construction and Construction phase** *Up to 14,805,472 m² of* subtidal *habitat loss/disturbance.* Pre-construction UXO removal: clearance of up to 25 UXOs (22 for Morgan Offshore Wind Project and 3 for the Morecambe Offshore Windfarm) ranging from 25 kg up to 907 kg, with 130 kg being the most likely maximum. Export cable installation: up to 11,331,680 m² of temporary habitat disturbance from installation of up to 484 km of buried offshore export cables (assumes 100% of all cables are buried) installed over 30 month sequential construction scenario: • Morgan Offshore Wind Project up to 400 km of offshore export cables – sandwave clearance: required for up to 9% of Morgan export cables – site preparation (boulder and debris clearance): is likely to be required across all export cables. Although, for the purposes of the MDS, boulder clearance only has been assumed across up to 91% of Morgan export cables and 91% (see justification); – seabed disturbance width of up to 60 m for sandwave clearance along Morgan export cables – seabed disturbance width of up to 20 m for boulder clearance along Morgan export cables; and – seabed disturbance width of up 3 m for cable burial. • Morecambe Offshore Wind Project up to 84 km of offshore export cables	**Construction phase** **Site preparation.** • The volume of material to be cleared from individual sandwaves will vary according to the local dimensions of the sandwave (height, length and shape) and the level to which the sandwave must be reduced. These details are not fully known at this stage, however based on the available data, it is anticipated that the sandwaves requiring clearance in the Transmission Assets are likely to be 8 m in height. • Site clearance activities may be undertaken using a range of techniques, the suction hopper dredger will result in the greatest increase in suspended sediment and largest plume extent as material is released near the water surface during the disposal of material. • Boulder clearance activities will result in minimal increases in SSCs and

Impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				– sandwave clearance: required for up to 9% of Morecambe export cables; – site preparation (boulder and debris clearance): is likely to be required across all export cables. Although, for the purposes of the MDS, boulder clearance only has been assumed across up to 91% of Morecambe export cables (see justification); – seabed disturbance width of up to 48 m for Morecambe export cables; – seabed disturbance width of up to 20 m for boulder clearance along Morecambe export cables; and – seabed disturbance width of up 3 m for cable burial. • Sandwave clearance material deposition: up to 2,853,600 m^2 of temporary habitat loss/disturbance associated with the deposition of: – up to 1,080,000 m3 of sandwave clearance material associated with the Morgan export cables affecting up to 2,160,000 m^2; and – up to 346,800 m3 of sandwave clearance material associated with the Morecambe export cables affecting up to 693,600 m^2. • Anchor placements: up to 60,000 m^2 of habitat disturbance from a 100 m^2 anchor set placement (five anchors per set) event every 500 m during offshore export cable installation within the nearshore area (10 km for each of the four Morgan export cables and each of the two Morecambe export cables). • Cable removal: up to 560,000 m^2 from the removal of 28 km of disused cables (disturbance width of up to 20 m). • Jack-up events to support offshore export cable pull: up to 192 m^2 of temporary habitat disturbance associated with two jack-up events for each of the four Morgan export cables and each of the two Morecambe export cables. Four legs per vessel, each with a 4 m^2 spud can affecting up to 16 m^2 per jack-up. **Operation and maintenance phase**	have therefore not been considered in the assessment. • The scenario assessed relates to the largest potential volume of material related to site preparation activities <u>Cable installation.</u> • Cable routes inevitably include a variety of seabed material and in some areas 3 m depth may not be achieved or may be of a coarser nature which settles in the vicinity of the cable route. The assessment therefore considers the upper bound in terms of suspended sediment and dispersion potential assuming a trench with “v” shape cross section. • Cables may be buried by ploughing, trenching or jetting with jetting mobilising the greatest volume of material to increase SSCs. The sequential construction scenario is included as the maximum design scenario as this results in the longest duration of impact. **Operations and maintenance phase** • The greatest foreseeable number of cable reburial and repair events is considered to the MDS for sediment dispersion. **Decommissioning phase**

Impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				• Project lifetime of 35 years. Up to 4,397,680 m² of temporary subtidal habitat disturbance *due to repair/reburial of export cables:* • Cable repair events: up to 1,680,000 m² of temporary habitat disturbance comprising: – up to 1,120,000 m² for repair of Morgan subtidal export cables: up to 14 repair events (one repair event for each of the four export cables every 10 years) affecting up to 4 km per repair event with a 20 m width of disturbance; and – up to 560,000 m² for repair of Morecambe subtidal export cables: up to seven repair events (one repair for each of the two export cables every 10 years) affecting up to 4 km per repair event with a 20 m width of disturbance. • Cable reburial events: up to 2,716,000 m² of temporary habitat disturbance comprising: – up to 2,240,000 m² for the reburial of Morgan subtidal export cables: one reburial event every five years (seven reburial events in total) affecting up to 16 km of export cables per event with a 20 m width of disturbance; and – up to 476,000 m² for the reburial of Morecambe subtidal export cables: one reburial event every five years (seven reburial events in total) raffecting up to 3.4 km of export cables per event with a 20 m width of disturbance. • Jack-up events: up to 1,680 m² from up to two jack-up events per year for the Morgan export cables, and up to one jack-up event per year for the Morecambe export cables. Four legs per vessel, each with a 4 m² spud can affecting up to 16 m² per jack-up. **Decommissioning phase**	Cables may be left *in situ* or may be removed. MDS considers the impacts of cables being removed and these are anticipated to be no greater than the impact assessed for the construction phase

Impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				Temporary subtidal habitat loss/disturbance due to: • Subtidal cable removal: disturbance from the removal of up to 484 km of Morgan and Morecambe export cables. •	
Indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species	✓	✓	✓	**Construction phase** Installation of up to 484 km of offshore export cables will lead to sound disturbance during construction (as described above). The MDS is that associated with the greatest impact on prey receptors. MDS on prey receptors can be found in Volume 2, Chapter 3: Fish and shellfish ecology and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES. **Operations and maintenance phase** Maximum number of vessel movements associated with operations and maintenance activities across the Transmission Assets (as described above). The MDS is that associated with the greatest impact on prey receptors. MDS on prey receptors can be found in Volume 2, Chapter 3: Fish and shellfish ecology and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES. **Decommissioning phase** Anticipated to be similar to construction disturbance activities.	Represents the maximum length of cables and the associated activities required for their construction, operations and maintenance and decommissioning. As described in Volume 2, Chapter 3: Fish and shellfish ecology and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES.

[a] C=construction, O=operations and maintenance, D=decommissioning

5.10 Assessment methodology

5.10.1 Overview

5.10.1.1 The approach to determining the significance of effects is a two-stage process that involves defining the magnitude of the potential impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to assign values to the magnitude of impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 5: Environmental assessment methodology of the ES.

5.10.2 Receptor sensitivity/value

5.10.2.1 The criteria for defining sensitivity in this chapter are outlined in **Table 5.18** below. The criteria are defined taking into account conservation value (**Table 5.17**) and the vulnerability of each species to relevant impacts. The information to inform the definition of sensitivity for each species is presented in **Table 5.11** and **Table 5.12**.

Table 5.17: Conservation value

Conservation value	Definition
International	Cited interest of SPA(s), including species identified in the review by Stroud *et al.* (2016) and those within the assemblage of an SPA
National	EU Birds Directive Annex I, EU Habitats Directive priority habitat/species Cited interest of SSSI(s)
Regional	Red Listed on BoCC, SPI
Local	Amber Listed on BoCC
Negligible	Very low importance and rarity, local scale, Green Listed on BoCC

Table 5.18: Sensitivity criteria

Sensitivity	Definition
Very High	Receptor of National or International value with very high vulnerability and/or no ability for recovery.
High	Receptor of Regional value with high vulnerability and/or no ability for recovery. Receptor of National or International value with high vulnerability and/or low recoverability.
Medium	Receptor of local value with high vulnerability and/or no ability for recovery. Receptor of Regional value with moderate to high vulnerability and/or low recoverability. Receptor of National or International value with moderate vulnerability and/or medium recoverability.
Low	Receptor of Local value with moderate to high vulnerability and/or low recoverability. Receptor of Regional value with low vulnerability and/or medium to high recoverability. Receptor of National or International value with low vulnerability and/or high recoverability.

Sensitivity	Definition
Negligible	Receptor is not vulnerable to the impact considered regardless of value/importance. Receptors of Local value with low vulnerability and/or medium to high recoverability.

5.10.3 Magnitude of impact

5.10.3.1 The criteria for defining magnitude in this chapter are outlined in **Table 5.19** below.

Table 5.19: Magnitude of impact criteria

Magnitude of impact		Definition
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
	Beneficial	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Medium	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/ damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Adverse	Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to, or positive addition of one or more characteristics, features or elements.
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

5.10.3.2 The following definitions apply to impact timescales.

- Short term: a period of months, up to one year.
- Medium term: a period of more than one year, up to five years.
- Long term: a period of greater than five years.

5.10.4 Significance of effect

5.10.4.1 The significance of the effect upon offshore ornithology has been determined by taking into account the sensitivity of the receptor and the magnitude of the potential impact. The method employed for this assessment is presented in **Table 5.20**.

5.10.4.2 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is

underpinned by narrative to explain the conclusions reached, including where a range of significance levels is presented.

5.10.4.3 For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the EIA Regulations.

Table 5.20: Assessment matrix

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	**Low**	**Medium**	**High**
Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Minor	Minor or Moderate	Moderate or Major	Major
Very High	Minor	Moderate or Major	Major	Major

5.10.4.4 The definitions for significance of effect levels are described as follows.

- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
- Moderate: These beneficial or adverse effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

5.11 Assessment of effects

5.11.1 Introduction

5.11.1.1 The impacts arising from the construction, operations and maintenance, and decommissioning phases of the Transmission Assets are listed in **Table 5.16**, along with the MDS against which each impact has been assessed.

5.11.1.2 As addressed in Section 5.2.2, the Secretary of State should refuse consent where harm to a protected species and relevant habitat would result, unless there is an overriding public interest and the other relevant legal tests are met. The Secretary of State would give substantial weight to any harm such as the detriment of biodiversity features of a national or regional importance or the climate resilience and capacity of habitats to store carbon, which they consider may result from a proposed development. Consideration of potential impacts on protected species is therefore provided in the Information to Support Appropriate Assessment part 3, where the assessment presented do not conclude any significant effects on any species or habitats. The National Policy Statement (NPS) for renewable energy emphasises the following potential impacts on birds to consider:

- collision with rotating blades;
- direct habitat loss;
- disturbance from construction activities such as the movement of construction/decommissioning vessels and pilling;
- displacement during the operational phase, resulting in loss of foraging/roosting area;
- impact on bird flight lines and associated increased energy ;
- impacts upon prey species and prey habitat; and
- impacts on protected sites.

5.11.1.3 A description of the likely effect on receptors caused by each identified impact is given below.

5.11.2 Disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure

5.11.2.1 The construction, operations and maintenance, and decommissioning phases of the Transmission Assets may lead to disturbance and displacement of birds. The MDS is represented by the maximum level of activity associated with the construction, operations and maintenance, and decommissioning phases of the Transmission Assets that would cause the greatest extent of disturbance and displacement to birds, or the greatest duration of impact. The MDS also represents the maximum underwater sound output from the maximum number of vessel and helicopter movements that would cause greatest visual and sound disturbance and displacement to birds from the Transmission Assets. The MDS is summarised in **Table 5.16**.

5.11.2.2 Disturbance as the result of activities during the construction, operations and maintenance, and decommissioning phases of the Transmission Assets has the potential to displace seabirds from an area of sea in which the activity is occurring. In relation to the Transmission Assets, displacement is defined as a reduction in the number of seabirds occurring within or immediately adjacent to the activities associated with the cable (Furness *et al.*, 2013).

5.11.2.3 Disturbance as a result of activities during the construction of an export cable (such as vessel movements) have the potential to displace birds. Construction activities result in a point source of disturbance, for example when construction vessels are at a location to undertake cable-laying. The level of disturbance associated with each location would vary depending on the activity undertaken. With regards to vessels associated with the Transmission Assets, for the majority of species there is no method to quantify the displacement impact of the activities due to their highly localised and temporary nature however, consideration is given on a qualitative basis. For red-throated diver and common scoter, two of the more sensitive species to disturbance in the context of the Transmission Assets, a quantitative approach is applied. An offshore EMP that includes measures to minimise disturbance to rafting birds from transiting vessels will be secured within the draft DCO (CoT65, **Table 5.15**) (see "Measures to minimise disturbance to marine mammals and rafting birds from vessels" (document reference J16)).

5.11.2.4 During the operations and maintenance phase, activities associated with the cable (e.g. routine surveys, repairs or reburials) have the potential to directly disturb seabirds leading to displacement from the impacted area including an area of variable size or buffer around it (Dierschke *et al.*, 2016). Therefore, the presence of vessels has the potential to directly disturb and displace seabirds that would normally reside within and around the area of sea.

Construction phase

5.11.2.5 Disturbance during the construction of the Transmission Assets (visual presence, vessel activity and underwater sound) may displace birds from an area of sea, effectively amounting to habitat loss during the period of disturbance (Drewitt and Langston, 2006). Such activities include:

- construction activities associated with the installation of the offshore export cable;
- movement of vessels and helicopters to and from construction areas;
- pre-construction site investigations including geophysical and geotechnical surveys;
- site preparation activities including surveys for UXOs, UXO removal, boulder removal, existing cable removal; and
- installation of cable crossings.

5.11.2.6 Disturbance caused by construction activities may directly displace birds from foraging or loafing areas thus potentially affecting breeding productivity or survival rates of an individual or population. However, on several occasions during the construction of Lincs offshore wind farm gulls were clearly associated with the jack-up barge, the guard vessels and with the construction vessel while piling was in progress (RPS, 2012). Disturbance caused by construction activities along the offshore cable corridor are considered to represent the MDS for relevant species as it is these areas that will be disproportionately affected by the presence of vessels and helicopters. The movements of vessels or helicopters to the Transmission Assets that occur within areas outside of the order limits for the Transmission Assets are

not considered to represent an effect larger than that that will occur at the Transmission Assets.

5.11.2.7 The offshore construction phase will be supported by various vessels including tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, crew transfer vessels and cable protection installation vessels. Helicopters may also be used during the construction phase for equipment and personnel transfer.

5.11.2.8 Although the port of origin for vessels has not yet been selected, any vessel movements are likely to occur along well-defined vessel routes, especially in areas closer to shore that may be occupied by sensitive species such as divers or sea duck. In addition, to this the Irish Sea is used extensively by vessels travelling to ports in the UK and further afield. As an example, shipping statistics for ports located in the Irish Sea (including Fleetwood, Liverpool, Manchester, Barrow-in-Furness, Lancaster, Llandulas, Mostyn and Heysham) show that in 2021 a total of 9,636 vessels arrived at these ports. If it is assumed that each vessel also leaves each port this would represent at least 19,272 vessel movements through the Liverpool Bay SPA per annum (averaging approximately 53 movements per day).

5.11.2.9 There are predicted to be 286 return trip vessel movements across per year during the construction phase of the Transmission Assets. This would represent a 3.0% increase on current traffic levels and would equate to less than one additional vessel movement per day. It should be noted, however, that this may represent an over-estimate as some of these vessel movements may originate from ports outside of the UK and therefore will not affect sensitive receptors that have a more coastal distribution. In addition, vessel movements from ports to the Transmission Assets are likely to follow existing shipping routes with these areas not likely to support notable densities of species sensitive to disturbance. Similarly, helicopter movements to the Transmission Assets will do so over areas already transited by other aircraft and vessels.

Sensitivity of the receptor

All receptors

5.11.2.10 The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**.

5.11.2.11 The sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure is presented in **Table 5.21**. Where vulnerability is defined as low, the receptor is not considered vulnerable to the impact and is therefore scoped out of further consideration. For the purposes of this impact, this is where the vulnerability of a receptor is categorised as 2 or lower for disturbance by vessels and helicopter and displacement from structures and a score of 3 or lower for habitat flexibility.

5.11.2.12 The U.S. Department of the Interior (2004) concluded that noise from seismic studies might only affect those species that spend large quantities of time underwater. Bird species most likely to be vulnerable to underwater sound are those that forage by diving after fish or shellfish and include auks, divers and seaduck. Gull and tern species feed at the surface only and are considered the least vulnerable. Fulmar, gulls and skuas are opportunistic scavengers that like terns will forage within tens of metres of moving machinery, including vessels and where feeding opportunities are recognised, close to humans when confident from experience to do so.

5.11.2.13 Common scoter and red-throated diver have been identified as receptors with a very high sensitivity to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure. Eider and cormorant have been identified as receptors with a high sensitivity to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure. Scaup and red-breasted merganser have been identified as receptors with a medium sensitivity to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure.

5.11.2.14 Common scoter are considered to be particularly vulnerable to disturbance from vessel traffic and are identified as one of the most vulnerable species to disturbance (Table 5.21; Wade *et al.*, 2016). Common scoter are known to aggregate in areas that have little shipping activity with the number of birds declining steeply with an increase in the level of shipping traffic (Kaiser *et al.*, 2002). The sensitivity to disturbance as defined by Wade *et al.* (2016) is based on the work by Kaiser *et al.* (2002), in particular the observations that common scoter flushed from a 35 m vessel at distances of 1000-2000 m for large flocks (26 observations) and <1000 m for smaller flocks (23 observations). Similar observations were also recorded by Schwemmer *et al.* (2011) with boats flushing birds over 1000 m distant. Therefore, in terms of behavioural response to visual and sound disturbance, common scoter are considered to be of high vulnerability.

5.11.2.15 Red-throated diver is considered to be a species with a very high vulnerability to vessel and helicopter disturbance (Table 5.21; Wade *et al.*, 2016). Divers exhibit a degree of susceptibility to disturbance by flushing on approach by a vessel and the distance of displacement may be substantial (Ruddock and Whitfield, 2007). Therefore, in terms of behavioural response to visual and sound disturbance, red-throated diver are considered to be of high vulnerability.

Table 5.21: Sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure (taken from Wade *et al.*, 2016)

Receptor	Conservation value	Vulnerability to disturbance by vessels and helicopter	Habitat flexibility	Recoverability	Sensitivity
Scaup	International	4 (High)	4 (Low)	Low	High
Eider	International	3 (Medium)	4 (Low)	High	Medium
Common scoter	International	5 (Very high)	4 (Low)	High	Very high
Red-breasted merganser	International	3 (Medium)	4 (Low)	Medium	Medium
Kittiwake	Regional	2 (Low)	2 (Medium)	Low	Negligible
Black-headed gull	International	2 (Low)	2 (Medium)	High	Negligible
Little gull	International	1 (Very low)	3 (Medium)	Medium	Negligible
Common gull	Local	2 (Low)	2 (Medium)	High	Negligible
Great black-backed gull	Local	1 (Very low)	2 (Medium)	Medium	Negligible
Herring gull	International	1 (Very low)	1 (High)	Medium	Negligible
Lesser black-backed gull	International	1 (Very low)	1 (High)	High	Negligible
Guillemot	Local	3 (Medium)	3 (Medium)	High	Low
Razorbill	Local	3 (Medium)	3 (Medium)	High	Low
Puffin	Regional	3 (Medium)	3 (Medium)	Medium	Medium
Red-throated diver	International	5 (Very high)	4 (Low)	High	Very high

Receptor	Conservation value	Vulnerability to disturbance by vessels and helicopter	Habitat flexibility	Recoverability	Sensitivity
Fulmar	Local	1 (Very low)	1 (High)	Low	Negligible
Manx shearwater	Local	1 (Very low)	1 (High)	Medium	Negligible
Gannet	Local	1 (Very low)	1 (High)	High	Negligible
Cormorant	International	4 (High)	3 (Medium)	Medium	High

Magnitude of impact

5.11.2.16 Disturbance associated with vessel/helicopter movements is of limited duration and also represents a transient impact as vessels/helicopters will be moving through an area. Impacts are therefore spatially and temporally restricted and are considered unlikely to affect the breeding productivity or survival rates of an individual or population. It is therefore considered that additional vessel and helicopter movements to and from the Transmission Assets will be indiscernible from baseline levels.

5.11.2.17 In general, it is considered that impacts are likely to last only for the duration of construction activity and therefore will be direct, but temporary, reversible and short-term in nature for a specific event. The construction of the Transmission Assets will occur over a maximum duration of 30 months (sequential construction scenario; **Table 5.16**). During the construction period, birds may return to areas when activities are not currently occurring. The largest impacts are likely to be due to the presence of vessels in any given area.

Common scoter

5.11.2.18 Lawson *et al.* (2016) showed that common scoter were shown to aggregate in two main areas within the Liverpool Bay Area of Search, to the north west of Rhyl and to the west of Blackpool (Figure 5.3 (Volume 2, Chapter figures)). The Offshore Order Limits passes through the south edge of the aggregation to the west of Blackpool. The distribution of common scoter does, however, vary through on inter- and intra-annual bases as illustrated by the density surface layers presented in HiDef Aerial Surveying Limited (2023) (Figure 5.8 and 5.9 (Volume 2, Chapter figures)).

5.11.2.19 In order to calculate the magnitude of impact associated with construction activities related to export cable installation the density surface layers presented in HiDef Aerial Surveying Limited (2023) have been obtained from Natural England. The survey data used to produce the density surface layers were collected during eight surveys undertaken in January, February or March between 2015 and 2020. The surveys covered an area corresponding to the area of the original designation for the Liverpool Bay SPA, stretching from offshore of Fleetwood, Lancashire, south to the Dee Estuary and then west to Point Lynas, Anglesey, extending approximately 22 km offshore in some places (Figure 5.3 (Volume 2, Chapter figures)). These density surfaces therefore only provide data for the inshore proportion of the Transmission Assets. This is the area where common scoter will be found within the Irish Sea, as indicated by the designation of the Liverpool Bay SPA and it is considered highly unlikely that significant numbers of common scoter will be found outside of this area and therefore the maximum potential impact can be calculated. This assumption is supported by the data used to support the extension to the Liverpool Bay SPA presented in Lawson *et al.* (2016) which shows negligible, if any, common scoter away from the key aggregations as incorporated into the original SPA designation (Figure 5.3 (Volume 2, Chapter figures)).

5.11.2.20 The impacts associated with export cable installation are expected to be highly localised as cable laying vessels are slow moving during the installation of cables. Furthermore, cable laying activity will be intermittent and therefore any displacement will be temporary and short term in nature. Vessels moving to and from construction areas will transit areas quickly, limiting the temporal scale of any effects and will likely utilise existing shipping routes. The area of habitat disturbed due to vessel movements is considered to be very small in the context of the distribution of common scoter (i.e. limited to the immediate vicinity of where works are being carried out) within the Liverpool Bay Area of Search. In addition, the increase in vessel traffic associated with the Transmission Assets is expected to be minimal when compared to the levels of vessel traffic already in the area.

5.11.2.21 The maximum area from which common scoter could be displaced due to construction activities associated with the Transmission Assets is defined as a 2 km buffer around the work area within which vessels associated with cable installation activities will be located. The worst case scenario for construction during the key wintering period for common scoter in Liverpool Bay is represented by the presence of five vessels working (CoT111) in two areas within the SPA. This includes the cable lay vessel and associated support vessels which will be within 1.5 km of the cable lay vessel. The maximum spatial extent associated with potential impacts is therefore 76.97 km^2 comprising two work areas with 3.5 km radii. The programme of works is not known in detail at this stage and therefore it is not known where along the cable route these work areas are located or the temporal periods in which they will occur.

5.11.2.22 In order to determine the potential impact on common scoter as a result of construction activities along the cable corridor, an estimate of the likely population present is required. The densities in each grid cell that fall within the cable corridor plus a 3.5 km buffer have been extracted from each monthly density surface associated with HiDef Aerial Surveying Limited (2023). For each month the densities for each grid cell have then been averaged to provide an average monthly density. The mean-peak density has been calculated by averaging the peak densities in each year.

5.11.2.23 The mean-peak density of common scoter within this area has been calculated as 91.49 birds/km^2. Multiplying this density by the zone of influence (76.97 km^2) gives a population of 8,368 birds.

5.11.2.24 JNCC *et al.,* (2022) recommend the use of a range of displacement rates of 90-100%. Applying these rates provides a displaced population of 7,531 to 8,368 birds. Following JNCC *et al.* (2022) interim guidance, a range of mortality rates have been applied to the displaced population of birds (**Table 5.22**).

5.11.2.25 The regional population for common scoter is defined as those populations within the Irish Sea. This includes populations within Liverpool Bay, the Solway Firth (NatureScot, 2020), the Ribble and Alt Estuaries (JNCC, 2015a), Bae Caerfyrddin/Carmarthen Bay (JNCC, 2015b), Dundalk Bay (NPWS, 2014), within the North-west Irish Sea SPA (NPWS, 2023) and within the Seas off Wexford SPA (NPWS, 2024). Populations for each site were taken from the sources provided. For Liverpool Bay, the average

population recorded in the Liverpool Bay SPA was used, calculated using the population data for the whole SPA presented in HiDef Aerial Surveying Limited (2023) (141,801 birds). This provided a total regional population of 177,307 birds.

Table 5.22: Disturbance mortality of common scoter from the Offshore Order Limits during construction

Magnitude of impact	Mortality rate (%)			
	1	2	5	10
Disturbance mortality (no. of birds)	75.3 to 83.7	150.6 to 167.3	376.5 to 418.4	753.1 to 836.8
% of regional population	0.04 to 0.05	0.08 to 0.09	0.21 to 0.24	0.42 to 0.47
% increase in baseline mortality	0.19 to 0.21	0.37 to 0.42	0.94 to 1.04	1.87 to 2.08

5.11.2.26 Vessels associated with construction activities (cable laying) are stationary for large periods of time and move only short distances during construction. Vessels will occupy discrete areas for limited periods of time and it is therefore assumed that disturbed birds will return to the area from which they have been disturbed following cessation of the source of disturbance and therefore the temporal extent of any impact will be brief. However, if birds were not to return to the area from they have been displaced, they would be able to move to other areas including those within the Liverpool Bay SPA or areas associated with other SPAs which contribute to the regional population. The zone of influence represents only 3.1% of the total Liverpool Bay SPA with any impacts also considered likely to be short-term with birds returning to the affected area upon cessation of the source of disturbance.

5.11.2.27 Definitive mortality rates associated with disturbance for common scoter are not known. As a result, a precautionary estimate must be applied. There is no evidence that birds (including common scoter) displaced from wind farms suffer any mortality as a consequence of displacement (e.g., Dierschke *et al.* 2017). Furthermore such impacts (i.e. of a wind farm) persist for much longer periods than those associated with Transmission Assets at construction, the former having a much larger magnitude of impact due to the much larger size of the area affected and therefore much larger area of habitat potentially unavailable to birds. The most likely source of mortality, if it were to occur, would be due to increased bird density in areas outside the affected area. This may lead to increased competition for prey resources.

5.11.2.28 On a precautionary basis, it is therefore considered that the application of a 1% mortality rate is suitably precautionary. The average baseline mortality rate for common scoter is 0.227 (calculated using demographic data from Horswill and Robinson, 2015). The predicted mortality from displacement therefore represents a 0.19 to 0.21% increase in the baseline mortality of the regional population of common scoter.

5.11.2.29 The impact is predicted to be of local spatial extent, medium term duration, intermittent and with high reversibility. It is therefore considered that the rate of mortality experienced by birds affected by disturbance will be low, especially given the large area across which birds are distributed within Liverpool Bay. It is predicted that the impact will affect the receptor directly although a very small number of individuals would be affected representing a limited fraction of the regional population and a limited increase in the baseline mortality of the affected population. The impact magnitude is therefore, considered to be **negligible**.

Red-throated diver

5.11.2.30 Lawson *et al.* (2016) showed that red-throated diver were abundant throughout Liverpool Bay, with the majority of the Liverpool Bay SPA boundary delineated based on the distribution of this species. The highest densities of the species occur off the Lancashire coast at Formby, off the coast of the Wirral, offshore of Llandulas on the north Wales coast and off the coast of Penmaenmawr, north Wales. Part of the Offshore Order Limits passes through an area of moderate density of red-throated diver Figure 5.4 (see Volume 2, Chapter figures).

5.11.2.31 In order to calculate the magnitude of impact associated with construction activities related to export cable installation the density surface layers presented in HiDef Aerial Surveying Limited (2023) have been obtained from Natural England. The survey data used to produce the density surface layers were collected during eight surveys undertaken in January, February or March between 2015 and 2020. The surveys covered an area corresponding to the area of the original designation for the Liverpool Bay SPA, stretching from offshore of Fleetwood, Lancashire, south to the Dee Estuary and then west to Point Lynas, Anglesey, extending approximately 22 km offshore in some places (Figure 5.4 (Volume 2, Chapter figures)). These density surfaces therefore only provide data for the inshore proportion of the Transmission Assets. This is the area where common scoter will be found within the Irish Sea, as indicated by the designation of the Liverpool Bay SPA and it is considered highly unlikely that significant numbers of red-throated diver will be found outside of this area and therefore the maximum potential impact can be calculated. This assumption is supported by the data used to support the extension to the Liverpool Bay SPA presented in Lawson *et al.* (2016) which shows negligible, if any, red-throated diver away from the key aggregations as incorporated into the original SPA designation (Figure 5.4 (Volume 2, Chapter figures)).

5.11.2.32 The impacts associated with export cable installation are expected to be highly localised as cable laying vessels are slow moving during the installation of cables. Furthermore, cable laying activity will be intermittent and therefore any displacement will be temporary and short term in nature. Vessels moving to and from construction areas will transit areas quickly, limiting the temporal scale of any effects and will likely utilise existing shipping routes. The area of habitat disturbed due to vessel movements is considered to be very small in the context of the distribution of common scoter (i.e. limited to the immediate vicinity of where works are being carried

out) within the Liverpool Bay SPA. In addition, the increase in vessel traffic associated with the Transmission Assets is expected to be minimal when compared to the levels of vessel traffic already in the area.

5.11.2.33 The maximum area from which red-throated diver could be displaced due to construction activities associated with the Transmission Assets is defined as a 2 km buffer around the work area within which vessels associated with cable installation activities will be located. The worst case scenario for construction during the key period for common scoter in Liverpool Bay is represented by the presence of five vessels (CoT111) working in two areas within the SPA. This includes the cable lay vessel and associated support vessels which will be within 1.5 km of the cable lay vessel. The maximum spatial extent associated with potential impacts is therefore 76.97 km^2 comprising two work areas with 3.5 km radii. The programme of works is not known in detail at this stage and therefore it is not known where along the cable route these work areas are located or the temporal periods in which they will occur.

5.11.2.34 In order to determine the potential impact on red-throated diver as a result of construction activities along the cable corridor, an estimate of the likely population present is required. The densities that fall within the cable corridor plus a 3.5 km buffer have been extracted from each monthly density surface associated with HiDef Aerial Surveying Limited (2023) (Figure 5.6 and 5.7 (Volume 2, Chapter figures)).. For each month the densities for each grid cell have then been averaged to provide an average monthly density. The mean-peak density has been calculated by averaging the peak densities in each year.

5.11.2.35 The mean-peak density of red-throated diver within this area has been calculated as 0.51 birds/km^2. Multiplying this density by the zone of influence (76.97 km^2) gives a population of 39.5 birds.

5.11.2.36 JNCC *et al.,* (2022) recommend the use of a range of displacement rates of 90-100%. Applying these rates provides a displaced population of 35.5 to 39.5 birds. Following JNCC *et al.* (2022) interim guidance, a range of mortality rates have been applied to the displaced population of birds (**Table 5.22**).

5.11.2.37 The regional population for red-throated diver is defined as those populations within the Irish Sea. Furness (2015) provides a population for the “NW England and Wales” BDMPS. This however, is considered to represent an underestimate as the population calculated for the Liverpool Bay SPA from HiDef Aerial Surveying Limited (2023) surpasses the population calculated by Furness (2015). The regional population has therefore been recalculated incorporating the following populations: Liverpool Bay, the Solway Firth (NatureScot, 2020), within the North-west Irish Sea SPA (NPWS, 2023), within the Seas off Wexford SPA (NPWS, 2024), associated with the Murrough SPA (NPWS, 2015) and The Raven SPA (NPWS, 2010). For Liverpool Bay, the average population recorded in the Liverpool Bay SPA was used, calculated using the population data for the whole SPA presented in HiDef Aerial Surveying Limited (2023) (141,801 birds). This provided a total regional population of 3,390 birds.

Table 5.23: Disturbance mortality of red-throated diver from the Offshore Order Limits during construction

Magnitude of impact	Mortality rate (%)			
	1	2	5	10
Disturbance mortality (no. of birds)	0.36 to 0.39	0.71 to 0.79	1.78 to 1.97	3.55 to 3.95
% of regional population	0.01 to 0.01	0.02 to 0.02	0.05 to 0.06	0.10 to 0.12
% increase in baseline mortality	0.05 to 0.05	0.09 to 0.10	0.23 to 0.26	0.46 to 0.51

5.11.2.38 Vessels associated with construction activities (cable laying) are stationary for large periods of time and move only short distances during construction, either as the export cable is installed. Vessels will occupy discrete areas for limited periods of time and it is therefore assumed that disturbed birds will return to the area from which they have been disturbed following cessation of the source of disturbance and therefore the temporal extent of any impact will be brief. However, if birds were not to return to the area from which they have been displaced, they would be able to move to other areas of the Liverpool Bay SPA with the affected area only representing 3.1% of the total SPA area. It is however, considered reasonable to assume that birds will return following completion of construction activities in a given area and therefore this calculation is precautionary.

5.11.2.39 Definitive mortality rates associated with disturbance of red-throated diver are not known. As a result, a precautionary estimate must be applied. The most likely source of mortality, if it were to occur, would be due to increased bird density in areas outside the affected area. This may lead to increased competition for prey resources. However, the area potentially affected by disturbance represents only 3.1% of the total Liverpool Bay SPA area and an even smaller proportion of the regional area available to birds with any impacts also considered likely to be short-term with birds returning to the affected area upon cessation of the source of disturbance.

5.11.2.40 A review of the ecological consequences to red-throated diver in relation to impacts associated with offshore wind farm developments concluded that “the available evidence suggested that the most likely result of displacement is that there will be little or no impact on adult survival and that any effect would probably be undetectable at the population level. Indeed, there is very little evidence to support the upper range of mortality effects for displaced birds advised by Natural England (e.g. up to 10%) and on the basis of a review of the studies (Vattenfall, 2019), even an additional mortality rate of 1% is considered precautionary” (MacArthur Green and Royal HaskoningDHV, 2021). This review was undertaken in relation to displacement of red-throated diver from much larger areas of sea than being considered in this assessment with such impacts persisting for much longer periods, having a much larger magnitude of impact due to the much larger

size of the area affected and therefore much larger area of habitat potentially unavailable to birds. It is therefore considered for the current assessment that the use of a 1% mortality is suitably precautionary. This is further supported by Thompson *et al.* (2023) which indicates that divers may have the capacity to adapt their foraging behaviour to reflect changing conditions and therefore be able to accommodate the additional energetic cost associated with displacement. Thompson *et al.* (2023) notes that this ability may however be limited by environmental conditions.

5.11.2.41 On a precautionary basis, it is therefore considered that the application of a 1% baseline mortality rate is suitably precautionary. The average baseline mortality rate for red-throated diver is 0.228 (calculated using demographic data from Horswill and Robinson, 2015). The predicted mortality from displacement therefore represents a 0.09-0.1% increase in the baseline mortality of the regional population of red-throated diver.

5.11.2.42 The impact is predicted to be of local spatial extent, medium term duration, intermittent and with high reversibility. It is therefore considered that the rate of mortality experienced by birds affected by disturbance will be low, especially given the large area across which birds are distributed within Liverpool Bay. It is predicted that the impact will affect the receptor directly with less than one bird predicted to be affected when applying appropriate mortality rates (1-2%) representing a limited proportion of the regional population and a limited increase in the baseline mortality of the affected population. The impact magnitude is therefore, considered to be **negligible**.

All other receptors

5.11.2.43 Due to the localised nature of the construction works, the impact is predicted to be of local spatial extent and short term duration. The impact is also intermittent and of high reversibility. The magnitude is therefore **negligible** for all other receptors.

Significance of the effect

5.11.2.44 **Table 5.24** sets out the significance of effect for all receptors. Due to the negligible magnitude of the impacts resulting from the disturbance and/or displacement of receptors as a result of airborne sound, underwater sound and presence of vessels and infrastructure during construction, the significance of effect is minor adverse or negligible for all receptors. Therefore, the significance of effect is **not significant** in EIA terms for any of the receptors.

Table 5.24: Significance of effect of disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure during construction

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Scaup	Medium	Negligible	Negligible
Eider	High	Negligible	Minor adverse
Common scoter	Very high	Negligible	Minor adverse
Red-breasted merganser	Medium	Negligible	Negligible
Kittiwake	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible
Little gull	Negligible	Negligible	Negligible
Common gull	Negligible	Negligible	Negligible
Great black-backed gull	Negligible	Negligible	Negligible
Herring gull	Negligible	Negligible	Negligible
Lesser black-backed gull	Negligible	Negligible	Negligible
Sandwich tern	Negligible	Negligible	Negligible
Common tern	Negligible	Negligible	Negligible
Guillemot	Low	Negligible	Negligible
Razorbill	Low	Negligible	Negligible
Puffin	Medium	Negligible	Negligible
Red-throated diver	Very high	Negligible	Minor adverse
Fulmar	Negligible	Negligible	Negligible
Manx shearwater	Negligible	Negligible	Negligible
Gannet	Negligible	Negligible	Negligible
Cormorant	High	Negligible	Minor adverse

Operations and maintenance

Sensitivity of the receptor

5.11.2.45 Disturbance to birds due to operational activities associated with the Transmission Assets will be limited to maintenance activities as well as vessel and helicopter trips to and from the site and also post-construction survey activity (e.g. asset integrity surveys). The MDS for the Transmission Assets considered for operations and maintenance disturbance is outlined in **Table 5.16**.

5.11.2.46 Although the port of origin for vessels has not yet been selected, any vessel movements are likely to occur along well-defined vessel routes, especially in areas closer to shore that may be occupied by sensitive species such as

divers or sea duck. In addition to this, the Irish Sea is used extensively by vessels travelling to ports in the UK and further afield. As an example, shipping statistics for ports located in the Irish Sea (including Fleetwood, Liverpool, Manchester, Barrow-in-Furness, Lancaster, Llandulas, Mostyn and Heysham) show that in 2021 a total of 9,636 vessels arrived at these ports. If it is assumed that each vessel also leaves each port this would represent at least 19,272 vessel movements through the Liverpool Bay SPA per annum (equating to approximately 53 movements per day).

5.11.2.47 There are predicted to be 77 return trip vessel movements per year during the operations and maintenance phase of the Transmission Assets. This would represent a 0.8% increase on current traffic levels. It should be noted, however, that this may represent an over-estimate as some of these vessel movements may originate from ports outside of the UK and therefore will not affect sensitive receptors that have a more coastal distribution. In addition, vessel movements from ports to the Transmission Assets are likely to follow to follow existing shipping routes with these areas not likely to support notable densities of species sensitive to disturbance. Similarly, helicopter movements to the Transmission Assets will do so over areas already transited by other aircraft and vessels.

5.11.2.48 The sensitivity of each receptor is as set out in the construction section above (**Table 5.21**). A summary is provided in **Table 5.25**.

Magnitude of impact

5.11.2.49 Disturbance associated with vessel/helicopter movements is of limited duration and also represents a transient impact as vessels/helicopters will be moving through an area. Impacts are therefore spatially and temporally restricted and are considered unlikely to affect the breeding productivity or survival rates of an individual or population. It is therefore considered that additional vessel and helicopter movements to and from the Transmission Assets will be indiscernible from baseline levels.

5.11.2.50 In general, it is considered that effects are likely to last only for the duration of vessel transit through relevant areas and therefore will be direct, but temporary, reversible and short-term in nature for a specific event. Following transit of vessels, birds may return to areas when activities were not currently occurring.

All receptors

5.11.2.51 The increase in vessel traffic associated with the operations and maintenance phase of the Transmission Assets is negligible when contextualised against the current levels of shipping traffic in the area in which the Transmission Assets are located. It is not anticipated that this increase will cause a measurable change in the level of disturbance already being experienced by receptors in this area.

5.11.2.52 Due to the limited number of vessel movements and localised nature of the operations and maintenance works, the impact is predicted to be of local spatial extent and long term duration. The impact is continuous and of high reversibility. The magnitude is therefore **negligible** for all receptors.

Significance of effect

5.11.2.53 Due to the negligible magnitude of the impacts resulting from the disturbance and/or displacement of receptors as a result of airborne sound, underwater sound and presence of vessels and infrastructure during operations and maintenance, the significance of effect is minor adverse or negligible for all receptors. Therefore, the significance of effect is **not significant** in EIA terms for any of the receptors.

5.11.2.54 **Table 5.25** sets out the significance of effect for all receptors during operations and maintenance.

Table 5.25: Significance of effect of disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure during operations and maintenance

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Scaup	Medium	Negligible	Negligible
Eider	High	Negligible	Minor adverse
Common scoter	Very high	Negligible	Minor adverse
Red-breasted merganser	Medium	Negligible	Negligible
Kittiwake	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible
Little gull	Negligible	Negligible	Negligible
Common gull	Negligible	Negligible	Negligible
Great black-backed gull	Negligible	Negligible	Negligible
Herring gull	Negligible	Negligible	Negligible
Lesser black-backed gull	Negligible	Negligible	Negligible
Sandwich tern	Negligible	Negligible	Negligible
Common tern	Negligible	Negligible	Negligible
Guillemot	Low	Negligible	Negligible
Razorbill	Low	Negligible	Negligible
Puffin	Medium	Negligible	Negligible
Red-throated diver	Very high	Negligible	Minor adverse
Fulmar	Negligible	Negligible	Negligible
Manx shearwater	Negligible	Negligible	Negligible
Gannet	Negligible	Negligible	Negligible
Cormorant	High	Negligible	Minor adverse

Decommissioning

5.11.2.55 Decommissioning activities associated with the Transmission Assets are equal to or less than those to be carried out during the construction phase. Therefore, for the purpose of this assessment it is assumed that the level of disturbance is likely to be similar and the potential impact on each species is deemed to be reversible in the short-term as birds are likely to return when activities have been completed.

Sensitivity of receptor

5.11.2.56 The sensitivity of each receptor is as set out in the construction section above (**Table 5.21**). A summary is provided in **Table 5.26**.

Magnitude of impact

5.11.2.57 The impact magnitude is considered to be identical to that estimated in the construction section. The magnitude is therefore negligible for all receptors.

Significance of effect

5.11.2.58 Due to the negligible magnitude of the impacts resulting from the disturbance and/or displacement of receptors as a result of airborne sound, underwater sound and presence of vessels and infrastructure during decommissioning, the significance of effect is minor adverse or negligible for all receptors. Therefore, the significance of effect is **not significant** in EIA terms for any of the receptors.

5.11.2.59 **Table 5.26** sets out the significance of effect for all receptors during decommissioning.

Table 5.26: Significance of effect of disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure during decommissioning

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Scaup	Medium	Negligible	Negligible
Eider	High	Negligible	Minor adverse
Common scoter	Very high	Negligible	Minor adverse
Red-breasted merganser	Medium	Negligible	Negligible
Kittiwake	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible
Little gull	Negligible	Negligible	Negligible
Common gull	Negligible	Negligible	Negligible
Great black-backed gull	Negligible	Negligible	Negligible
Herring gull	Negligible	Negligible	Negligible
Lesser black-backed gull	Negligible	Negligible	Negligible
Sandwich tern	Negligible	Negligible	Negligible
Common tern	Negligible	Negligible	Negligible
Guillemot	Low	Negligible	Negligible
Razorbill	Low	Negligible	Negligible
Puffin	Medium	Negligible	Negligible
Red-throated diver	Very high	Negligible	Minor adverse
Fulmar	Negligible	Negligible	Negligible
Manx shearwater	Negligible	Negligible	Negligible
Gannet	Negligible	Negligible	Negligible
Cormorant	High	Negligible	Minor adverse

5.11.3 Indirect impacts from underwater sound, habitat loss and increased suspended sediment concentrations affecting prey species

Construction Phase

5.11.3.1 Potential impacts on prey species during the construction and decommissioning phases of the Transmission Assets, as identified in Volume 2, Chapter 3: Fish and Shellfish Ecology and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES, may have indirect effects on offshore ornithology receptors.

5.11.3.2 Detailed assessments of the following potential construction impacts have been undertaken in Volume 2 Chapter 3: Fish and Shellfish Ecology and

Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES for key seabird prey species (including cod, sprat, herring, mackerel and sandeel species and bivalves).

- Temporary habitat loss/disturbance from all project phases.
- Underwater sound impacting fish and shellfish receptors in all project phases.
- Increased SSCs and associated sediment deposition during all project phases.
- Long term habitat loss during all project phases.
- Disturbance/remobilisation of sediment-bound contaminants during all project phases.

5.11.3.3 Herring and sandeel are sensitive to offshore wind development (including underwater sound). Both species are listed as main prey items for several seabird species (Cramp and Simmons, 1983). Volume 2, Chapter 3: Fish and Shellfish Ecology of the ES determined the area of the Transmission Assets to be largely unsuitable for herring and sandeel and therefore effects of habitat loss/disturbance on these species are expected to be limited within the Transmission Assets, given the abundance of similar substrate types and the extensive nature of fish spawning grounds across the wider study area.

5.11.3.4 Volume 2, Chapter 2: Benthic subtidal and intertidal ecology and Volume 2, Chapter 3: Fish and Shellfish Ecology of the ES detail the findings of the desktop studies in the Benthic Ecology study area and the Fish and Shellfish Ecology study area. Both chapters assessed the sensitivity of the receptors and the magnitudes of the impacts in order to ascertain the significance of the effects.

5.11.3.5 Details of the fish, shellfish and bivalve ecology assessment are summarised in **Table 5.27**. Justifications for this assessment will not be repeated in this chapter. Evidence, modelling and justifications for these assessments are provided in Volume 2, Chapter 3: Fish and Shellfish Ecology of the ES.

Table 5.27: Significance of effects of construction impacts on fish, shellfish and bivalve ecology

Potential impact	Species	Significance of effect
Temporary habitat loss/disturbance	Fish (including herring and sandeel)	Minor adverse
	Shellfish	Minor adverse
	Bivalves	Minor adverse
Underwater sound impacting fish and shellfish receptors	Fish (including herring, cod, sprat, allis shad and twaite shad)	Minor adverse
	Shellfish	Minor adverse
Increased SSCs and associated sediment deposition	Fish (including herring and sandeel)	Minor adverse
	Shellfish	Minor adverse

Potential impact	Species	Significance of effect
	Bivalves	Minor adverse
Long term habitat loss	Fish (including herring and sandeel)	Minor adverse
	Shellfish	Minor adverse
	Bivalve	Minor adverse
Disturbance/remobilisation of sediment-bound contaminants	Fish	Minor adverse
	Shellfish	Minor adverse
	Bivalves	Negligible or minor adverse

5.11.3.6 An assessment of the significance of indirect effects on sensitive receptors (i.e. those resulting from the influence of construction activity on prey species) was made on the basis of knowledge of the prey species targeted by each species, as well as their level of inflexibility of habitat use (Wade *et al.*, 2016). The results of these analyses were evaluated against the indirect impacts on seabird prey resource and habitats as detailed in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology and Volume 2, Chapter 3: Fish and Shellfish Ecology of the ES and prior information from operational wind farms.

Sensitivity of receptor

All receptors

5.11.3.7 The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**.

5.11.3.8 The sensitivity of all receptors to indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species is presented in **Table 5.28**.

5.11.3.9 Although the impact of underwater sound on fish has been well studied, there is no published evidence linking reduction of prey availability to avoidance/displacement of seabirds. In absence of information on vulnerability to underwater sound and reduction of prey availability at offshore wind farms, sensitivity is based solely on habitat flexibility, as set out in **Table 5.28**.

Magnitude of impact

5.11.3.10 For all fish, shellfish and bivalve species, an effect of minor adverse significance was determined for all indirect impacts from underwater sound, habitat loss and increased SSCs. Due to the nature of the impact, these minor adverse effects on prey species will be extremely localised and will be of negligible magnitude when considered against the wide areas over which seabirds forage.

Common scoter

5.11.3.11 Lawson *et al.* (2016) showed that common scoter were shown to aggregate in two main areas within the Liverpool Bay Area of Search, to the north west of Rhyl and to the west of Blackpool. The Offshore Order Limits passes through the south edge of the aggregation to the west of Blackpool (Figure 5.3 (Volume 2, Chapter figures)).

5.11.3.12 Common scoter are mussel specialists. A study of common scoter in the North Sea found bivalves to form 95% of a common scoter's diet (Durinck *et al.* 1993). Due to the construction of the Transmission Assets leading to a minor adverse effect on bivalves within an extremely localised area (as set out in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES), the impacts of construction on the prey sources of common scoter as a result of indirect impacts from underwater sound, habitat loss and increased SSCs will be of negligible magnitude when considered against the wide areas over which common scoters are able to forage.

Red-throated diver

5.11.3.13 Lawson *et al.* (2016) showed that red-throated diver were abundant throughout Liverpool Bay SPA, with the majority of the SPA boundary delineated based on the distribution of this species. The highest densities of the species occur off the Lancashire coast at Formby, off the coast of the Wirral, offshore of Llandulas on the north Wales coast and off the coast of Penmaenmawr, north Wales. Part of the Offshore Order Limits passes through an area of moderate density of red-throated diver (Figure 5.4 (Volume 2, Chapter figures)).

Table 5.28: Sensitivity of all receptors to indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species

Receptor	Conservation value	Habitat flexibility	Recoverability	Sensitivity
Scaup	International	4 (Low flexibility)	Low	High
Eider	International	4 (Low flexibility)	High	High
Common scoter	International	4 (Low flexibility)	High	High
Red-breasted merganser	International	4 (Low flexibility)	Medium	High
Kittiwake	Regional	2 (Medium flexibility)	Low	Negligible
Black-headed gull	International	2 (Medium flexibility)	High	Negligible
Little gull	International	3 (Medium flexibility)	Medium	Negligible
Common gull	Local	2 (Medium flexibility)	High	Negligible
Great black-backed gull	Local	2 (Medium flexibility)	Medium	Negligible
Herring gull	International	1 (High flexibility)	Medium	Negligible
Lesser black-backed gull	International	1 (High flexibility)	High	Negligible
Guillemot	Local	3 (Medium flexibility)	High	Negligible
Razorbill	Local	3 (Medium flexibility)	High	Negligible
Puffin	Regional	3 (Medium flexibility)	Medium	Negligible
Red-throated diver	International	4 (Low flexibility)	High	High
Fulmar	Local	1 (High flexibility)	Low	Negligible
Manx shearwater	Local	1 (High)	Medium	Negligible
Gannet	Local	1 (High)	High	Negligible
Cormorant	International	3 (Medium)	Medium	Negligible

5.11.3.14 Red-throated divers feed on a variety of fish species (Kleinschmidt *et al.*, 2019). Due to the construction of the Transmission Assets leading to a minor adverse effect on fish within an extremely localised area (as set out in Volume 2, Chapter 3: Fish and shellfish ecology of the ES), the impacts of construction on the prey sources of red-throated diver as a result of indirect impacts from underwater sound, habitat loss and increased SSCs will be of negligible magnitude when considered against the wide areas over which red-throated divers forage.

All other receptors

5.11.3.15 Due to the localised nature of the construction works, the impact is predicted to be of local spatial extent and short term duration. For all fish, shellfish and bivalve prey species, an effect of minor adverse significance was determined for all indirect impacts from underwater sound, habitat loss and increased SSCs. The impact is also intermittent and of high reversibility. The magnitude is therefore negligible for all other receptors.

Significance of effect

5.11.3.16 **Table 5.29** sets out the significance of effect for all receptors. Due to the negligible magnitude of the effects resulting from indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species during construction, the significance of effect is minor adverse or negligible for all receptors. Therefore, the significance of effect is **not significant** in EIA terms for any of the receptors.

Table 5.29: Significance of effect of indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species during construction

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Scaup	High	Negligible	Minor adverse
Eider	High	Negligible	Minor adverse
Common scoter	High	Negligible	Minor adverse
Red-breasted merganser	High	Negligible	Minor adverse
Kittiwake	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible
Little gull	Negligible	Negligible	Negligible
Common gull	Negligible	Negligible	Negligible
Great black-backed gull	Negligible	Negligible	Negligible
Herring gull	Negligible	Negligible	Negligible
Lesser black-backed gull	Negligible	Negligible	Negligible
Guillemot	Negligible	Negligible	Negligible
Razorbill	Negligible	Negligible	Negligible

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Puffin	Negligible	Negligible	Negligible
Red-throated diver	High	Negligible	Minor adverse
Fulmar	Negligible	Negligible	Negligible
Manx shearwater	Negligible	Negligible	Negligible
Gannet	Negligible	Negligible	Negligible
Cormorant	Negligible	Negligible	Negligible

Operations and maintenance

5.11.3.17 The indirect impacts on seabird prey resource and habitats are detailed in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology and Volume 2, Chapter 3: Fish and Shellfish Ecology of the ES. Principal impacts on these resources and habitats are likely to be from the creation of hard substrate around export cables, and increases in sedimentation in the water column.

5.11.3.18 Detailed assessments of the following potential operations and maintenance phase impacts have been undertaken in Volume 2, Chapter 3: Fish and Shellfish Ecology and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES for key seabird prey species (including cod, sprat, herring, mackerel and sandeel species and bivalves) and include:

- long term habitat loss due to scour/cable protection;
- underwater sound as a result of maintenance vessel traffic and other non-piling activities;
- temporary habitat loss and disturbance from maintenance operations (e.g. jack up operations and cable reburial);
- introduction of scour/cable protection (hard substrates and structural complexity);
- Electromagnetic Fields (EMF) emitted by export cables; and
- disturbance/remobilisation of sediment-bound contaminants.

5.11.3.19 Details of the fish, shellfish and bivalve ecology assessment are summarised in **Table 5.30**. Evidence, modelling and justifications for these assessments are provided in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology and Volume 2, Chapter 3: Fish and Shellfish Ecology of the ES and so justifications for this assessment will not be repeated in this chapter.

Table 5.30: Significance of effects of operations and maintenance impacts on fish, shellfish and bivalve ecology

Potential impact	Species	Significance of effect
Temporary habitat loss/disturbance	Fish (including herring and sandeel)	Minor adverse
	Shellfish	Minor adverse
	Bivalves	Minor adverse

Potential impact	Species	Significance of effect
Underwater sound from non-piling activities	Fish (including herring, cod, sprat, allis shad and twaite shad)	Negligible
	Shellfish	Negligible
Increased SSCs and associated sediment deposition	Fish (including herring and sandeel)	Negligible
	Shellfish	Negligible
	Bivalves	Minor adverse
Long term habitat loss	Fish (including herring and sandeel)	Minor adverse
	Shellfish	Minor adverse
	Bivalve	Minor adverse
EMF from subsea electrical cabling	Fish	Minor adverse
	Shellfish	Minor adverse
Disturbance/remobilisation of sediment-bound contaminants	Fish	Negligible
	Shellfish	Negligible
	Bivalves	Negligible

Sensitivity of receptor

5.11.3.20 The sensitivity of each receptor is as set out in the construction section above (**Table 5.28**). A summary is provided in **Table 5.31**.

Magnitude of impacts

5.11.3.21 For all fish, shellfish and bivalve species, an effect of minor adverse or negligible significance was determined for all indirect impacts from underwater sound, habitat loss and increased SSCs during operations and maintenance. Due to the localised nature of the impact, these minor adverse effects on prey species will be extremely localised and will be of negligible magnitude when considered against the wide areas over which seabirds forage.

Common scoter

5.11.3.22 As set out in the construction section above, common scoter are mussel specialists. Due to the operations and maintenance of the Transmission Assets leading to a minor adverse effect on bivalves within an extremely localised area (as set out in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology), the impacts of operations and maintenance on the prey sources of common scoter as a result of indirect impacts from underwater sound, habitat loss and increased SSCs will be of negligible magnitude when considered against the wide areas over which common scoters are able to forage.

Red-throated diver

5.11.3.23 Lawson *et al.* (2016) showed that red-throated diver were abundant throughout Liverpool Bay SPA, with the majority of the SPA boundary delineated based on the distribution of this species. The highest densities of the species occur off the Lancashire coast at Formby, off the coast of the Wirral, offshore of Llandulas on the north Wales coast and off the coast of Penmaenmawr, north Wales. Part of the Offshore Order Limits passes through an area of moderate density of red-throated diver (Figure 5.4 (Volume 2, Chapter figures)).

5.11.3.24 As set out in the construction section above, part of the Offshore Order Limits passes through an area of moderate density of red-throated diver. Due to the operations and maintenance of the Transmission Assets leading to a minor adverse effect on fish within an extremely localised area (as set out in Volume 2, Chapter 3: Fish and Shellfish Ecology of the ES), the impacts of operations and maintenance on the prey sources of red-throated diver as a result of indirect impacts from underwater sound, habitat loss and increased SSCs will be of negligible magnitude when considered against the wide areas over which red-throated divers forage.

All other receptors

5.11.3.25 Due to the localised nature of the operations and maintenance works, the impact is predicted to be of local spatial extent and short term duration. For all fish, shellfish and bivalve prey species, an effect of minor adverse significance was determined for all indirect impacts from underwater sound, habitat loss and increased SSCs. The impact is also intermittent and of high reversibility. The magnitude is therefore negligible for all other receptors

Significance of effect

5.11.3.26 **Table 5.31** sets out the significance of effect for all receptors. Due to the negligible magnitude of the impacts resulting from indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species during construction, the significance of effect is minor adverse or negligible for all receptors. Therefore, the significance of effect is **not significant** in EIA terms for any of the receptors.

Table 5.31: Significance of effect of indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species during operation

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Scaup	High	Negligible	Minor adverse
Eider	High	Negligible	Minor adverse
Common scoter	High	Negligible	Minor adverse
Red-breasted merganser	High	Negligible	Minor adverse

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Kittiwake	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible
Little gull	Negligible	Negligible	Negligible
Common gull	Negligible	Negligible	Negligible
Great black-backed gull	Negligible	Negligible	Negligible
Herring gull	Negligible	Negligible	Negligible
Lesser black-backed gull	Negligible	Negligible	Negligible
Guillemot	Negligible	Negligible	Negligible
Razorbill	Negligible	Negligible	Negligible
Puffin	Negligible	Negligible	Negligible
Red-throated diver	High	Negligible	Minor adverse
Fulmar	Negligible	Negligible	Negligible
Manx shearwater	Negligible	Negligible	Negligible
Gannet	Negligible	Negligible	Negligible
Cormorant	Negligible	Negligible	Negligible

Decommissioning

5.11.3.27 Decommissioning activities with the Offshore Order Limits are equal to or less than those carried out during the construction phase. Therefore, for the purpose of this assessment it is assumed that the level of disturbance is likely to be similar and the potential impact is deemed to be reversible in the short-term as birds are likely to return when activities have been completed.

Sensitivity of receptor

5.11.3.28 The sensitivity of each receptor is as set out in the construction section above (**Table 5.28**). A summary is provided in **Table 5.32**.

Magnitude of impact

5.11.3.29 Due to the localised nature of the decommissioning works, the impact is predicted to be of local spatial extent and short term duration. The impact is also intermittent and of high reversibility. The magnitude is therefore negligible for all receptors.

Significance of effect

5.11.3.30 **Table 5.32** sets out the significance of effect for all receptors. Due to the negligible magnitude of the impacts resulting from indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species during construction, the significance of effect is minor adverse or negligible

for all receptors. Therefore, the significance of effect is **not significant** in EIA terms for any of the receptors.

Table 5.32: Significance of effect of indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species during decommissioning

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Scaup	High	Negligible	Minor adverse
Eider	High	Negligible	Minor adverse
Common scoter	High	Negligible	Minor adverse
Red-breasted merganser	High	Negligible	Minor adverse
Kittiwake	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible
Little gull	Negligible	Negligible	Negligible
Common gull	Negligible	Negligible	Negligible
Great black-backed gull	Negligible	Negligible	Negligible
Herring gull	Negligible	Negligible	Negligible
Lesser black-backed gull	Negligible	Negligible	Negligible
Guillemot	Negligible	Negligible	Negligible
Razorbill	Negligible	Negligible	Negligible
Puffin	Negligible	Negligible	Negligible
Red-throated diver	High	Negligible	Minor adverse
Fulmar	Negligible	Negligible	Negligible
Manx shearwater	Negligible	Negligible	Negligible
Gannet	Negligible	Negligible	Negligible
Cormorant	Negligible	Negligible	Negligible

5.11.4 Temporary habitat loss/disturbance and increased SSCs

5.11.4.1 There is potential for temporary, direct benthic habitat loss and disturbance to sediments as a result of activities during all phases (e.g. seabed preparation, UXO detonation, cable installation and repair/reburial) (see Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES). This has potential to affect the foraging efficiency of diving birds as well as indirect effects from impacts on fish, shellfish and bivalve prey.

5.11.4.2 Seabirds may be indirectly disturbed and displaced during the construction, operations and maintenance, and decommissioning phases as a result of direct impacts on habitat and increased SSCs, which may result in the loss of a food resource to birds within the Offshore Order Limits. The increase in

suspended sediments may also reduce the ability of birds to capture prey in the water column.

5.11.4.3 Detailed assessments of the following potential impacts have been undertaken in Volume 2, Chapter 3: Fish and shellfish ecology of the ES and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES for key seabird prey species (including cod, sprat, herring, mackerel and sandeel species and bivalves) and include:

- temporary habitat loss and disturbance from installation and maintenance operations (e.g. jack up operations and cable reburial); and
- disturbance/remobilisation of sediment-bound contaminants during installation and maintenance activities.

5.11.4.4 As a result, displaced seabirds may move to areas already occupied by other birds and thus face higher intra/inter-specific competition due to a higher density of individuals competing for the same resource. Alternatively, displaced birds may be forced to move into areas of lower quality (e.g. areas of lower prey availability). Such disturbance and resulting displacement could ultimately affect their demographic fitness (i.e. survival rates and breeding productivity) as well as potentially impacting on other birds in areas that displaced birds move to.

5.11.4.5 The potential construction phase impacts on fish, shellfish and bivalve prey are provided in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES, and Volume 2, Chapter 3: Fish and shellfish ecology of the ES and include temporary subtidal habitat loss/disturbance and increased SSCs and associated sediment deposition.

5.11.4.6 There is potential for temporary, direct benthic habitat loss and disturbance to sediments as a result of activities during all phases (e.g., seabed preparation, UXO detonation, cable installation and repair/reburial).

5.11.4.7 This has potential to affect the foraging efficiency of diving birds as well as indirect effects from impacts on fish and shellfish prey.

All phases

Sensitivity of receptor

All receptors

5.11.4.8 The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability.

5.11.4.9 The sensitivity of all receptors temporary habitat loss/disturbance and increased SSCs is presented in **Table 5.33**.

Magnitude of impact

5.11.4.10 The increase in SSCs may lead to a short-term avoidance of affected areas that support fish and shellfish species which are susceptible to increased SSCs. However, many fish and shellfish species are considered to be

tolerant of turbid environments and regularly experience changes in the SSC due to the natural variability in the Irish Sea.

5.11.4.11 In the absence of quantitative information available, the magnitude is considered qualitatively and taking into consideration the assessment of significance on marine fish species presented in Volume 2 Chapter 3: Fish and shellfish ecology of the ES, which concluded minor adverse significance, which is not significant in EIA terms.

5.11.4.12 Temporary habitat loss could potentially affect spawning, nursery or feeding grounds of fish and shellfish receptors, with demersal fish and shellfish, and demersal spawning species the most vulnerable. If impacted this could then lead to a reduction in prey availability for bird species The spatial extent of the MDS assessed in Volume 2 Chapter 3: Fish and shellfish ecology of the ES represented a very small proportion of the Transmission Assets.

5.11.4.13 The impact is predicted to be of local spatial extent, short-duration, intermittent and reversible. It is predicted that the impact will affect the features indirectly. The magnitude is therefore, considered to be negligible.

Significance of effect

5.11.4.14 For all fish, shellfish and bivalve species, an effect of minor adverse significance was determined for all indirect impacts from temporary habitat loss/disturbance and increased SSCs. Due to the localised nature of the impact, these minor adverse effects on prey species will be extremely localised and will be of negligible magnitude when considered against the wide areas over which seabirds forage.

5.11.4.15 Due to the negligible magnitude of the impacts resulting from temporary habitat loss/disturbance and increased SSCs, the significance of effect is minor adverse or negligible for all receptors. Therefore, the significance of effect is **not significant** in EIA terms for any of the receptors.

Table 5.33: Sensitivity of all receptors to temporary habitat loss/disturbance and increased SSCs

Receptor	Conservation value	Habitat flexibility	Recoverability	Sensitivity
Scaup	International	4 (Low)	Low	High
Eider	International	4 (Low)	High	High
Common scoter	International	4 (Low)	High	High
Red-breasted merganser	International	4 (Low)	Medium	High
Kittiwake	Regional	2 (Medium)	Low	Negligible
Black-headed gull	International	2 (Medium)	High	Negligible
Little gull	International	3 (Medium)	Medium	Negligible
Common gull	Local	2 (Medium)	High	Negligible
Great black-backed gull	Local	2 (Medium)	Medium	Negligible
Herring gull	International	1 (High)	Medium	Negligible
Lesser black-backed gull	International	1 (High)	High	Negligible
Guillemot	Local	3 (Medium)	High	Negligible
Razorbill	Local	3 (Medium)	High	Negligible
Puffin	Regional	3 (Medium)	Medium	Negligible
Red-throated diver	International	4 (Low)	High	High
Fulmar	Local	1 (High)	Low	Negligible
Manx shearwater	Local	1 (High)	Medium	Negligible
Gannet	Local	1 (High)	High	Negligible
Cormorant	International	3 (Medium)	Medium	Negligible

5.11.4.16 **Table 5.34** sets out the significance of effect for all receptors during decommissioning.

Table 5.34: Significance of effect of temporary habitat loss/disturbance and increased SSCs

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Scaup	High	Negligible	Minor adverse
Eider	High	Negligible	Minor adverse
Common scoter	High	Negligible	Minor adverse
Red-breasted merganser	High	Negligible	Minor adverse
Kittiwake	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible
Little gull	Negligible	Negligible	Negligible
Common gull	Negligible	Negligible	Negligible
Great black-backed gull	Negligible	Negligible	Negligible
Herring gull	Negligible	Negligible	Negligible
Lesser black-backed gull	Negligible	Negligible	Negligible
Guillemot	Negligible	Negligible	Negligible
Razorbill	Negligible	Negligible	Negligible
Puffin	Negligible	Negligible	Negligible
Red-throated diver	High	Negligible	Minor adverse
Fulmar	Negligible	Negligible	Negligible
Manx shearwater	Negligible	Negligible	Negligible
Gannet	Negligible	Negligible	Negligible
Cormorant	Negligible	Negligible	Negligible

5.11.5 Future monitoring

5.11.5.1 The assessment of impacts on offshore ornithology as a result of the construction, operation and maintenance, and decommissioning phases of the Transmission Assets are predicted to be not significant in EIA terms. Based on the predicted impacts to offshore ornithology receptors, it is concluded that no specific monitoring to test the predictions made within the impact assessment is required.

5.12 Cumulative effects assessment methodology

5.12.1 Introduction

5.12.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Transmission Assets together with other projects and

plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 1, Annex 5.5: Cumulative screening matrix and location plan of the ES). Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

5.12.1.2 The offshore ornithology CEA methodology has followed the methodology set out in Volume 1, Chapter 5: Environmental assessment methodology of the ES. As part of the assessment, all projects and plans considered alongside the Transmission Assets have been allocated into 'tiers' reflecting their current stage within the planning and development process.

- Scenario 1: Transmission Assets together with Morecambe Offshore Windfarm: Generation Assets.
- Scenario 2: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets.
- Scenario 3: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets.
- Scenario 4: Scenario 3 together with Tier 1, Tier 2 and Tier 3 projects, plans and activities, defined as follows.
  - Scenario 4a: Scenario 3 and Tier 1 projects, plans and activities which are:
    - under construction;
    - permitted application;
    - submitted application; or
    - those currently operational that were not operational when baseline data were collected and/or those that are operational but have an ongoing impact.
  - Scenario 4b: Scenario 4a and Tier 2 projects, plans and activities which a:
    - Scoping Report has been submitted in the public domain.
  - Scenario 4c: Scenario 4b and Tier 3 projects, plans and activities which are:
    - where a Scoping Report has not been submitted and it is not in the public domain;
    - identified in the relevant Development Plan; or
    - identified in other plans and programmes.

5.12.1.3 This assessment is followed by all other relevant projects, identified by tier. This tiered approach is adopted to provide a clear assessment of the Transmission Assets alongside other projects, plans and activities.

The specific projects, plans and activities scoped into the CEA, are outlined in **Table 5.35**. Tier 2 and 3 projects are only included in the following

cumulative assessments if information is available to inform the assessment. In practice, this generally requires that an assessment has been published for these projects although sometimes enough information can be obtained from other sources (e.g. a project's website). Without an assessment it is not possible to provide an indication as to the impact of the project as information such as baseline characterisation and project design are unavailable (for example the proposed Mooir Vannin offshore wind farm project in IoM Waters where a Scoping report has been submitted but no assessment is yet available).

Table 5.35: List of other projects, plans and activities considered within the CEA.

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Morecambe Offshore Windfarm: Generation Assets	Application submitted	0	480 MW Offshore wind farm G (generating assets)	2026 - 2039	2029 - 2064	The construction, operations and maintenance and decommissioning phases of this project will overlap with the construction, operations and maintenance and decommissioning phases of the Transmission Assets.
Morgan Offshore Wind Project: Generation Assets	Application submitted	0	1.5GW Offshore wind farm (generating assets)	2026 - 2030	2030 - 2065	The construction, operations and maintenance and decommissioning phases of this project will overlap with the construction, operations and maintenance and decommissioning phases of the Transmission Assets.
Tier 1						
Offshore Renewable Projects						
Mona Offshore Wind Project	Application submitted	9.73	Offshore wind farm (generating assets) and offshore export cable (transmission assets)	2026 - 2030	2030 - 2065	The construction, operations and maintenance and decommissioning phases of this project will overlap with the construction, operations and maintenance and decommissioning phases of the Transmission Assets.
Walney Extension	Operational (with ongoing activities)	5.71	Up to 659 MW (87 wind turbines)	Constructed	2018 - 3038	The operations and maintenance and decommissioning phases of this project will temporally overlap

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Offshore Wind Farm						with the construction and operations and maintenance phases of the Transmission Assets.
West of Duddon Sands Offshore Wind Farm	Operational (with ongoing activities)	6.47	Up to 389 MW (108 wind turbines)	Constructed	2014 - 2034	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
West of Duddon Sands Offshore Wind Farm Operational Marine Licence operations and maintenance activities (MLA/2016/00150/3)	Operational	6.47	Covers licensable operations and maintenance activities to be carried out as and when required over the lifetime of the wind farm.	n/a	2016 - 2037	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Walney 2 Offshore Wind Farm	Operational (with ongoing activities)	10.17	Up to 367 MW (51 wind turbines)	Constructed	2012 - 2032	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Walney 1 and 2 Offshore Wind Farms Operational	Operational	10.17	Covers licensable operations and maintenance activities to be carried out as and	n/a	2016 - 2032	These maintenance activities will temporally overlap with the construction and operations and

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Marine Licence - operations and maintenance activities (MLA/2016/00151/3)			when required over the lifetime of the wind farms.			maintenance phases of the Transmission Assets.
Walney Offshore Wind Farm Operational Marine Licence - inter array cable repair (MLA/2013/00426/2)	Operational	10.17	Emergency inter-array cable repairs over the operational life time of the Walney Offshore Wind Farm (1 and 2). To ensure adequate contingency plans are in place to react to a major breakage/fault in an inter array cable.	n/a	2018 - 2032	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Walney 2 Offshore Wind Farm, Composite Operational and Maintenance (O&M) Marine Licence Application	Operational	10.17	Operations and maintenance events including removal of marine growth and/or guano from substation, export cable repair events, with associated anchoring/jacking-up/vessel beaching, remediation events (via jetting and/or mass flow excavator) of up to 7 km length per event, potential jacking-up to and removal and/or replacement of cable/scour protection	n/a	2018 - 2038	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
			and deployment of additional cable protection adjacent to existing cable protection to resolve secondary scour issues.			
Walney 1 Offshore Wind Farm	Operational	11.40	Up to 367 MW (51 wind turbines)	2010 - 2011	2011 - 2031	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Walney Offshore Wind Farm Operational Marine Licence - phase 2 export cable (MLA/2014/00027/7)	Operational	11.91	Emergency export cable repairs over the operational life time of the Walney Offshore Wind Farm export cables (two) to ensure adequate contingency plans are in place to react to a major breakage/fault within a reasonable period of time.	n/a	2014 - 2027	These maintenance activities will temporally overlap with the construction phase of the Transmission Assets.
Walney Offshore Wind Farm Operational Marine Licence - composite operations and maintenance activities	Operational	15.32	For future cable repair/remediation/protection works on the Walney 1 export cable and also for potential repair works on the Walney 1 Offshore Substation Platform.	n/a	2017 - 2037	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
(MLA/2017/00081/2)						
Walney Offshore Wind Farm Operational Marine Licence - phase 1 export cable (MLA/2014/00028/5)	Operational	15.32	Emergency export cable repairs over the operational life time of the Walney Offshore Wind Farm export cables (two) to ensure adequate contingency plans are in place to react to a major breakage/fault in a reasonable period of time.	n/a	2014 - 2027	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Routine operations and maintenance activities at five OSPs (Barrow, Ormonde, Lincs, Westermost Rough and Gunfleet Sands) (MLA/2017/00100/1)	Operational	19.66	Repainting of offshore structures, removal of algal growth/bird guano and removal of growth around J Tubes.	n/a	2017 - 2038	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Ormonde Offshore Wind Farm Operational Marine Licence - operations and maintenance activities	Operational	20.05	Operations and maintenance activities to be carried out as and when required over the lifetime of the wind farm.	n/a	2017 - 2037	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
(MLA/2016/00224/2)						
Ormonde Offshore Wind Farm Operational Marine Licence - export cable repair and remediation (MLA/2015/00086/2)	Operational	20.48	Five cable repair events, with associated jacking-up; and 10 x cable remediation events (via jetting).	n/a	2015 - 2030	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Burbo Bank Extension Offshore Wind Farm	Operational (with ongoing activities)	25.77	Up to 258 MW (32 wind turbines)	2016 – 2017	2017 – 2042	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Burbo Bank Offshore Wind Farm Operational Marine Licence – cable repair and remediation (MLA/2014/00336/1)	Operational	25.77	Burbo Bank cable repair and remediation works (no further information)	n/a	2018 – 2043	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Burbo Bank Extension Operational Marine Licence – array cable repair and remediation	Operational	25.77	Up to 10 discrete array cable repair or remediation events over the lifetime of the wind farm (25 years).	n/a	2018 – 2042	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
activities (MLA/2017/00164)						
Burbo Bank Offshore Wind Farm	Operational (with ongoing activities)	26.24	Up to 90 MW (25 wind turbines)	2004 - 2005	2007 - 2032	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Burbo Bank Offshore Wind Farm Operational Marine Licence - export cable repair/remediation activities (MLA/2016/00406)	Operational	26.24	Up to four discrete export cable repair/remediation events over the remaining lifetime of the wind farm (15 years).	n/a	2018 - 2032	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Burbo Bank Offshore Wind Farm Operational Marine Licence - inter-array cable repair (MLA/2014/00336/1)	Operational	26.24	For works which would be undertaken should any inter array cables at Burbo Bank Offshore Wind Farm fail. This is a pre-emptive application which is designed to limit downtime in any such situation where the cables fail.	n/a	2014 - 2032	These maintenance activities will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Burbo Bank Extension Operational	Operational	27.52	Up to four discrete export cable repair or remediation events over	n/a	2017 - 2042	These maintenance activities will temporally overlap with the construction and operations and

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Marine Licence - export cable repair and remediation activities (MLA/2017/00166/1)			the lifetime of the wind farm (25 years).			maintenance phases of the Transmission Assets.
Gwynt y Mor Offshore Wind Farm	Operational (with ongoing activities)	28.86	Up to 750 MW (150 to 250 wind turbines)	2008 - 2011	2011 - 2061	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Awel y Môr Offshore Wind Farm	Consent granted	28.87	Up to 100 MW (48 to 91 wind turbines)	2026 - 2030	2030 - 2055	The construction, operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Ormonde Offshore Wind Farm	Operational (with ongoing activities)	34.20	Up to 150 MW (30 wind turbines)	2009 - 2010	2011 - 2036	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
Robin Rigg (Robin Rigg East	Operational	73.34	174 MW project	2009	2010 to 2035	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
and Robin Rigg West)						operations and maintenance phases of the Transmission Assets.
Robin Rigg Offshore Wind Farm Operational Marine Licence - Export Cable	Operational	72.11	Three repairs per cable for the remaining life of the wind farm. Length of cable expected to be 200 m. No more than four jack up barge visits required	2015	2035	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction and operations and maintenance phases of the Transmission Assets.
West Anglesey Demonstration Zone tidal site	Consent granted	78.71	240 MW tidal project	Unknown	Unknown	Potential construction, operations and maintenance and decommissioning phase overlap
Project Erebus – Floating Offshore Wind Project	Consent granted	284.61	100 MW Test & Demonstration project in the Celtic Sea	2023 – 2026	2027 - unknown	Potential construction, operations and maintenance and decommissioning phase overlap
White Cross	Consent granted	311.28	100 MW site. Up to eight turbines, off of the Devon and Cornwall Coast.	2024 – 2026	2027 – unknown	Potential construction, operations and maintenance and decommissioning phase overlap
Twinhub	Consent granted	398.86	Two floating offshore wind platforms, each with two wind turbines. Installed capacity of 32 MW.	2024 – 2025	2026 - unknown	Potential construction, operations and maintenance and decommissioning phase overlap
Cables and Pipelines						
Isle of Man to UK Interconnector Cable -	Operational (with ongoing activities)	0	Placement of additional armouring or protection whilst carrying out	n/a	2018-2033	The activities associated with this site will overlap with the construction and operations and

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Maintenance and Repair			contingency repair and maintenance works			maintenance phases of the Transmission Assets.
Isle of Man Interconnector Cable - Cable Protection Remedial Works	Permitted but not yet implemented	0.62	Potential repair and maintenance activities along the Isle of Man interconnector cable route in UK waters, should any works be required. Two original concrete mattresses used for cable protection will be removed.	n/a	2018-2033	Should any activities associated with this site be carried out, they could overlap with the construction and operation and/or maintenance phases of the Transmission Assets.
Tier 3						
MaresConnect – Wales-Ireland Interconnector Cable	Pre-application	34.44	A proposed subsea and underground electricity interconnector system linking the existing electricity grids in Ireland and Great Britain.	2025	2027 - 2037	The operations and maintenance and decommissioning phases of this project will temporally overlap with the construction, operations and maintenance phases of the Transmission Assets.
Isle of Man – UK Interconnector 2	Pre-application	Unknown	A new 70 MW to 100 MW HVAC interconnector to be operational by 2030 between the Isle of Man and north west England.	2024 to 2030	2030 onwards	The location/route of the interconnector is currently unknown however there is potential for it to pass through the Liverpool Bay SPA. This project is likely to overlap with the construction and operation and maintenance phases of the Transmission Assets.
Mooir Vannin - UK Transmission Assets	Pre-application	N/A	Comprising of offshore export cables and a booster station to connect	2030 to 2033	2033 onwards	The construction and operation and maintenance phases of this project may temporally overlap

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
			the Mooir Vannin Offshore Wind Farm to the UK.			with the operation and maintenance and decommissioning phases of the Transmission Assets.

5.12.2 Scope of cumulative effects assessment

5.12.2.1 The impacts identified in **Table 5.36** have been selected as those having the potential to result in the greatest cumulative effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been based on the Project Design Envelope set out in Volume 1, Chapter 3: Project description of the ES as well as the publicly available information available on other projects and plans.

Table 5.36: Scope of assessment of cumulative effects

Cumulative effect	C	O	D	Project(s) considered	Justification
Disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure.	✓	✓	✓	Maximum design scenario as described for the Transmission Assets (**Table 5.16**) assessed cumulatively with the following other projects/plans. • Morecambe Offshore Windfarm: Generation Assets • Morgan Offshore Wind Project: Generation Assets **Tier 1** • Walney Extension Offshore Wind Farm. • West of Duddon Sands Offshore Wind Farm. • West of Duddon Sands Offshore Wind Farm Operational Marine Licence operations and maintenance activities (MLA/2016/00150/3). • Walney 2 Offshore Wind Farm. • Walney 1 and 2 Offshore Wind Farms Operational Marine Licence - operations and maintenance activities (MLA/2016/00151/3). • Walney Offshore Wind Farm Operational Marine Licence - inter array cable repair (MLA/2013/00426/2). • Walney 2 Offshore Wind Farm, Composite Operational and Maintenance (O&M) Marine Licence Application. • Walney 1 Offshore Wind Farm. • Walney Offshore Wind Farm Operational Marine Licence - phase 2 export cable (MLA/2014/00027/7). • Walney Offshore Wind Farm Operational Marine Licence - composite operations and maintenance activities (MLA/2017/00081/2).	There is potential for activities associated with the Transmission Assets to overlap temporally with activities associated with projects considered cumulatively.

Cumulative effect	C	O	D	Project(s) considered	Justification
				• Walney Offshore Wind Farm Operational Marine Licence - phase 1 export cable (MLA/2014/00028/5). • Routine operations and maintenance activities at five OSPs (Barrow, Ormonde, Lincs, Westermost Rough and Gunfleet Sands) (MLA/2017/00100/1). • Ormonde Offshore Wind Farm Operational Marine Licence - operations and maintenance activities (MLA/2016/00224/2). • Ormonde Offshore Wind Farm Operational Marine Licence - export cable repair and remediation (MLA/2015/00086/2). • Burbo Bank Extension Offshore Wind Farm. • Burbo Bank Offshore Wind Farm Operational Marine Licence – cable repair and remediation (MLA/2014/00336/1). • Burbo Bank Extension Operational Marine Licence – array cable repair and remediation activities (MLA/2017/00164). • Burbo Bank Offshore Wind Farm. • Burbo Bank Offshore Wind Farm Operational Marine Licence - export cable repair/remediation activities (MLA/2016/00406). • Burbo Bank Offshore Wind Farm Operational Marine Licence - inter-array cable repair (MLA/2014/00336/1). • Burbo Bank Extension Operational Marine Licence - export cable repair and remediation activities (MLA/2017/00166/1). • Gwynt y Mor Offshore Wind Farm. • Awel y Môr Offshore Wind Farm.	

Cumulative effect	C	O	D	Project(s) considered	Justification
				• Ormonde Offshore Wind Farm. • Mona Offshore Wind Project . • Project Erebus – Floating Offshore Wind Project. • Robin Rigg (Robin Rigg East and Robin Rigg West). • Robin Rigg Offshore Wind Farm Operational Marine Licence - Export Cable. • Twinhub. • West Anglesey Demonstration Zone tidal site. • White Cross. • Isle of Man Interconnector Cable - Cable Protection Remedial Works. • Isle of Man to UK Interconnector Cable - Maintenance and Repair. **Tier 3** • MaresConnect – Wales-Ireland Interconnector Cable. • Isle of Man - UK Interconnector 2. • Mooir Vannin – UK Transmission Assets.	
Indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species.	✓	✓	✓	Maximum design scenario as described for the Transmission Assets (**Table 5.16**) assessed cumulatively with the following other projects/plans. • Morecambe Offshore Windfarm: Generation Assets. • Morgan Offshore Wind Project: Generation Assets. **Tier 1** • Walney Extension Offshore Wind Farm. • West of Duddon Sands Offshore Wind Farm.	There is potential for activities associated with the Transmission Assets to overlap temporally with activities associated with projects considered cumulatively.

Cumulative effect	C	O	D	Project(s) considered	Justification
				• West of Duddon Sands Offshore Wind Farm Operational Marine Licence operations and maintenance activities (MLA/2016/00150/3). • Walney 2 Offshore Wind Farm. • Walney 1 and 2 Offshore Wind Farms Operational Marine Licence - operations and maintenance activities (MLA/2016/00151/3). • Walney Offshore Wind Farm Operational Marine Licence - inter array cable repair (MLA/2013/00426/2). • Walney 2 Offshore Wind Farm, Composite Operational and Maintenance (O&M) Marine Licence Application. • Walney 1 Offshore Wind Farm. • Walney Offshore Wind Farm Operational Marine Licence - phase 2 export cable (MLA/2014/00027/7). • Walney Offshore Wind Farm Operational Marine Licence - composite operations and maintenance activities (MLA/2017/00081/2). • Walney Offshore Wind Farm Operational Marine Licence - phase 1 export cable (MLA/2014/00028/5). • Routine operations and maintenance activities at five OSPs (Barrow, Ormonde, Lincs, Westermost Rough and Gunfleet Sands) (MLA/2017/00100/1). • Ormonde Offshore Wind Farm Operational Marine Licence - operations and maintenance activities (MLA/2016/00224/2). • Ormonde Offshore Wind Farm Operational Marine Licence - export cable repair and remediation (MLA/2015/00086/2).	

Cumulative effect	C	O	D	Project(s) considered	Justification
				• Burbo Bank Extension Offshore Wind Farm. • Burbo Bank Offshore Wind Farm Operational Marine Licence – cable repair and remediation (MLA/2014/00336/1). • Burbo Bank Extension Operational Marine Licence – array cable repair and remediation activities (MLA/2017/00164). • Burbo Bank Offshore Wind Farm. • Burbo Bank Offshore Wind Farm Operational Marine Licence - export cable repair/remediation activities (MLA/2016/00406). • Burbo Bank Offshore Wind Farm Operational Marine Licence - inter-array cable repair (MLA/2014/00336/1). • Burbo Bank Extension Operational Marine Licence - export cable repair and remediation activities (MLA/2017/00166/1). • Gwynt y Mor Offshore Wind Farm. • Awel y Môr Offshore Wind Farm. • Ormonde Offshore Wind Farm. • Mona Offshore Wind Project. • Project Erebus – Floating Offshore Wind Project. • Robin Rigg (Robin Rigg East and Robin Rigg West). • Robin Rigg Offshore Wind Farm Operational Marine Licence - Export Cable. • Twinhub. • West Anglesey Demonstration Zone tidal site. • White Cross.	

Cumulative effect	C	O	D	Project(s) considered	Justification
				• Isle of Man Interconnector Cable - Cable Protection Remedial Works. • Isle of Man to UK Interconnector Cable - Maintenance and Repair. **Tier 3** • MaresConnect – Wales-Ireland Interconnector Cable. • Isle of Man - UK Interconnector 2. • Mooir Vannin – UK Transmission Assets.	
Temporary habitat loss/disturbance and increased SSCs.	✓	×	✓	Maximum design scenario as described for the Transmission Assets (**Table 5.16**) assessed cumulatively with the following other projects/plans. • Morecambe Offshore Windfarm: Generation Assets. • Morgan Offshore Wind Project: Generation Assets. **Tier 1** • Walney Extension Offshore Wind Farm. • West of Duddon Sands Offshore Wind Farm. • West of Duddon Sands Offshore Wind Farm Operational Marine Licence operations and maintenance activities (MLA/2016/00150/3). • Walney 2 Offshore Wind Farm. • Walney 1 and 2 Offshore Wind Farms Operational Marine Licence - operations and maintenance activities (MLA/2016/00151/3). • Walney Offshore Wind Farm Operational Marine Licence - inter array cable repair (MLA/2013/00426/2).	There is potential for activities associated with the Transmission Assets to overlap temporally with activities associated with projects considered cumulatively.

Cumulative effect	C	O	D	Project(s) considered	Justification
				• Walney 2 Offshore Wind Farm, Composite Operational and Maintenance (O&M) Marine Licence Application. • Walney 1 Offshore Wind Farm. • Walney Offshore Wind Farm Operational Marine Licence - phase 2 export cable (MLA/2014/00027/7). • Walney Offshore Wind Farm Operational Marine Licence - composite operations and maintenance activities (MLA/2017/00081/2). • Walney Offshore Wind Farm Operational Marine Licence - phase 1 export cable (MLA/2014/00028/5). • Routine operations and maintenance activities at five OSPs (Barrow, Ormonde, Lincs, Westermost Rough and Gunfleet Sands) (MLA/2017/00100/1). • Ormonde Offshore Wind Farm Operational Marine Licence - operations and maintenance activities (MLA/2016/00224/2). • Ormonde Offshore Wind Farm Operational Marine Licence - export cable repair and remediation (MLA/2015/00086/2). • Burbo Bank Extension Offshore Wind Farm. • Burbo Bank Offshore Wind Farm Operational Marine Licence – cable repair and remediation (MLA/2014/00336/1). • Burbo Bank Extension Operational Marine Licence – array cable repair and remediation activities (MLA/2017/00164). • Burbo Bank Offshore Wind Farm.	

Cumulative effect	C	O	D	Project(s) considered	Justification
				• Burbo Bank Offshore Wind Farm Operational Marine Licence - export cable repair/remediation activities (MLA/2016/00406). • Burbo Bank Offshore Wind Farm Operational Marine Licence - inter-array cable repair (MLA/2014/00336/1). • Burbo Bank Extension Operational Marine Licence - export cable repair and remediation activities (MLA/2017/00166/1). • Gwynt y Mor Offshore Wind Farm. • Awel y Môr Offshore Wind Farm. • Ormonde Offshore Wind Farm. • Mona Offshore Wind Project. • Project Erebus – Floating Offshore Wind Project. • Robin Rigg (Robin Rigg East and Robin Rigg West). • Robin Rigg Offshore Wind Farm Operational Marine Licence - Export Cable. • Twinhub. • West Anglesey Demonstration Zone tidal site. • White Cross. • Isle of Man Interconnector Cable - Cable Protection Remedial Works. • Isle of Man to UK Interconnector Cable - Maintenance and Repair. **Tier 3** • MaresConnect – Wales-Ireland Interconnector Cable.	

Cumulative effect	C	O	D	Project(s) considered	Justification
				• Isle of Man - UK Interconnector 2. • Mooir Vannin – UK Transmission Assets.	

[a] C=construction, O=operation and maintenance, D=decommissioning

5.13 Cumulative effects assessment

5.13.1 Introduction

5.13.1.1 A description of the significance of cumulative effects upon offshore ornithology receptors arising from each identified impact is given below.

5.13.1.2 The CEA is presented in a series of tables (one for each potential cumulative impact) and considers the following.

- Scenario 1: Transmission Assets together with Morecambe Offshore Windfarm: Generation Assets.
- Scenario 2: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets.
- Scenario 3: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets.
- Scenario 4a to 4c: Transmission Assets together with the Generation Assets (Scenario 3) and other relevant projects and plans (Tier 1, Tier 2, and Tier 3).

5.13.1.3 For all receptors the magnitude of impacts associated with the Transmission Assets were assessed to be negligible for all receptors. For all receptors, the significance of impacts was also therefore negligible or minor adverse and not significant. The receptors for which an impact significance of minor adverse was predicted were cormorant, common scoter, eider, red-breasted merganser, red-throated diver and scaup. The cumulative effects assessment therefore focuses on these receptors. The impact on these receptors is restricted to discrete populations associated with the Liverpool Bay SPA and therefore the spatial scope of the cumulative effects assessment is based upon the largest spatial scale which corresponds with the Liverpool Bay SPA. Only plans or projects that interact with Liverpool Bay SPA and its qualifying features are considered in this assessment.

5.13.1.4 Therefore, in line with the EIA Scoping Report, the cumulative effects assessment for the Transmission Assets will solely focus on plans or projects that have a source-impact pathway that coincides spatially and temporally the Transmission Assets (i.e. a project that falls within or immediately adjacent to the Offshore Order Limits and overlaps in its timings) for the populations of those receptors considered in the assessment.

5.13.2 Disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure

Table 5.37: Disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure cumulative assessment scenarios for each phase for Scenarios 1, 2 and 3

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
Construction phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure are consistent with the sensitivities defined for the project alone assessment (**Table 5.21**). Offshore ornithological receptors are deemed to be of Very High to Very Low vulnerability, High to Medium recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be Very High to Low.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets will be constructed at the same time as the Transmission Assets and therefore there will be a temporal overlap. The Morecambe Offshore Windfarm: Generation Assets ES identified potential disturbance and displacement impacts during construction, although impacts are considered to be short-term, temporary and reversible in nature, with birds expected to return to an area once construction activities have ceased. Common scoter were recorded in four of the aerial surveys undertaken to characterise the baseline at the Morecambe Offshore	The Morgan Offshore Wind Project: Generation Assets will be constructed at the same time as the Transmission Assets and therefore there will be a temporal overlap. Common scoter and red-throated diver were not recorded in site-specific surveys undertaken to characterise the baseline at the Morgan Offshore Wind Project: Generation Assets and were therefore scoped out of the assessments conducted for the project. As a result, the cumulative magnitude of the Transmission Assets and the Morgan Offshore Wind Project: Generation Assets will be the same as the Transmission Assets 'alone' during construction and will be negligible.	Common scoter and red-throated diver were not recorded in site-specific surveys undertaken to characterise the baseline at the Morgan Offshore Wind Project: Generation Assets and were therefore scoped out of the assessments conducted for the project. The assessment conclusions for Scenario 3 are therefore identical to those concluded for Scenario 1. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morgan Offshore Wind Project: Generation Assets or Morecambe Offshore Windfarm: Generation

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	Windfarm: Generation Assets. The predicted impact was considered to represent less than a 0.01% increase in the baseline mortality of the regional population and it was therefore concluded that the magnitude of increase would not materially alter the background mortality of the population and would be undetectable. The magnitude of impact was therefore negligible resulting in an impact of minor adverse significance. Red-throated diver are considered to be of high sensitivity to disturbance and displacement during construction of Morecambe Offshore Windfarm: Generation Assets. During baseline aerial surveys of the project, red-throated divers were recorded in small numbers, being most abundant in the winter period with a mean-peak population of 12 birds. The assessments concluded that the annual impact would be between zero and one bird, increasing the baseline mortality of the regional population by 0.1%. This magnitude of impact was not considered to materially alter the background mortality of the regional population and would be undetectable. The magnitude of impact was therefore negligible resulting in an impact of minor adverse significance. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts	Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morgan Offshore Wind Project: Generation Assets and therefore the cumulative impact magnitude for these species remains as predicted in **section 5.11.2** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	Assets and therefore the cumulative impact magnitude for these species remains as predicted in **section 5.11.2** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	as part of the assessments for the Morecambe Offshore Windfarm: Generation Assets and therefore the cumulative impact magnitude for these species remains as predicted in **section 5.11.2** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.		
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Operation and maintenance phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure are consistent with the sensitivities defined for the project alone assessment (**Table 5.21**).		

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	Offshore ornithological receptors are deemed to be of Very High to Very Low vulnerability, High to Medium recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be Very High to Low.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets will be operational at the same time as the Transmission Assets and therefore there will be a temporal overlap. The assessments undertaken for other offshore ornithological receptors in the operations and maintenance phase of the Morecambe Offshore Windfarm: Generation Assets focus on the impact of displacement from the Morecambe Offshore Windfarm: Generation Assets array area plus a species-specific buffer. Displacement is a permanent impact, persisting throughout the lifetime of a project, whereas disturbance, such as that associated with the operations and maintenance phase of the Transmission Assets is a temporary, intermittent impact. Common scoter were recorded in four of the aerial surveys undertaken to characterise the baseline at the Morecambe Offshore Windfarm: Generation Assets. The predicted impact was considered to represent less than a 0.01% increase in the baseline mortality of the regional population and it was therefore concluded that the magnitude of increase would not materially alter the background mortality of the population and would be undetectable. The magnitude of impact was therefore negligible resulting in an impact of minor adverse significance.	The Morgan Offshore Wind Project: Generation Assets will be operational at the same time as the Transmission Assets and therefore there will be a temporal overlap. Common scoter and red-throated diver were not recorded in site-specific surveys undertaken to characterise the baseline at the Morgan Offshore Wind Project: Generation Assets and were therefore scoped out of the assessments conducted for the project. The assessments undertaken for other offshore ornithological receptors in the operations and maintenance phase of the Morgan Offshore Wind Project: Generation Assets focus on the impact of displacement from the Morgan Offshore Wind Project: Generation Assets array area plus a species-specific buffer. Displacement as a permanent impact, persisting throughout the lifetime of a project, whereas disturbance, such as that associated with the operations and maintenance phase of the Transmission Assets is a temporary, intermittent impact. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morgan Offshore Wind Project: Generation Assets and therefore the cumulative impact magnitude for these species	Common scoter and red-throated diver were not recorded in site-specific surveys undertaken to characterise the baseline at the Morgan Offshore Wind Project: Generation Assets and were therefore scoped out of the assessments conducted for the project. The assessment conclusions for Scenario 3 are therefore identical to those concluded for Scenario 1. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morgan Offshore Wind Project: Generation Assets or Morecambe Offshore Windfarm: Generation Assets and therefore the cumulative impact magnitude for these species remains as predicted in **section 5.11.2** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	Red-throated divers were recorded in small numbers during baseline characterisation surveys of the Morecambe Offshore Windfarm: Generation Assets, being most abundant in the winter period with a mean-peak population of 12 birds. The assessments concluded that the annual impact would be between zero and two birds, increasing the baseline mortality of the regional population by 0.19%. This magnitude of impact was not considered to materially alter the background mortality of the regional population and would be undetectable. The magnitude of impact was therefore negligible resulting in an impact of minor adverse significance. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morecambe Offshore Windfarm: Generation Assets and therefore the cumulative impact magnitude for these species remains as predicted in **section 5.11.2** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	remains as predicted in **section 5.11.2** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible	

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Decommissioning phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure are consistent with the sensitivities defined for the project alone assessment (**Table 5.21**). Offshore ornithological receptors are deemed to be of Very High to Very Low vulnerability, High to Medium recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be Very High to Low.		
Magnitude of impact	The impact magnitude is considered to be to the same as that estimated in the construction section. The magnitude is therefore negligible for all receptors. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	The impact magnitude is considered to be to the same as that estimated in the construction section. The magnitude is therefore negligible for all receptors. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	The impact magnitude is considered to be to the same as that estimated in the construction section. The magnitude is therefore negligible for all receptors. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species

Table 5.38: Disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure cumulative assessment scenarios for each phase for Scenarios 4a, 4b and 4c

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
Construction phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure are consistent with the sensitivities defined for the project alone assessment (**Table 5.21**). Offshore ornithological receptors are deemed to be of Very High to Very Low vulnerability, High to Medium recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be Very High to Low.		
Magnitude of impact	The CEA for Scenario 4a includes the Transmission Assets and Generation Assets (Scenario 3) and the Tier 1 projects identified in **Table 5.35**. The construction phase of the Transmission Assets and Generation Assets will overlap with the construction or operation and maintenance phase of projects identified in Tier 1. Projects for which the construction phase may overlap with the Transmission Assets and Generation Assets are the: - Mona Offshore Wind Project (Transmission Assets only) - Awel y Môr Offshore Wind Farm - Erebus Offshore Wind Farm - White Cross Offshore Wind Farm The construction and / or operations and maintenance phase of all other Tier 1 projects will overlap temporally, to some extent, with the construction phase of the Transmission Assets and Generation Assets. Assessments	As no Tier 2 projects have been identified as contributing to a cumulative impact alongside the Transmission Assets and those projects considered in Scenario 4a, the conclusions reached in Scenario 4a are also applicable to Scenario 4b. The cumulative effect is predicted to be of regional spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	In addition to those projects considered as part of Scenario 4b, Scenario 4c also considers impacts associated with the following Tier 3 projects: • the MaresConnect – Wales to Ireland Interconnector cable; and • Isle of Man Interconnector Cable 2 The MaresConnect cable project will commence in 2025 and consists of a subsea and underground electricity interconnector system linking the existing electricity grids in Ireland and Great Britain. The operation and maintenance and decommissioning phases of this project will temporally overlap with the construction and operation and maintenance phases of the Transmission Assets. The MaresConnect Interconnector Supporting Information for Screening for Appropriate Assessments (MaresConnect, 2023) ruled out any pathways to any effects of the Liverpool Bay/Bae Lerpwl SPA and/or it's qualifying

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	undertaken considered cumulatively focus on the impact of displacement. Displacement is a permanent impact, persisting throughout the lifetime of a project, whereas disturbance is a temporary, intermittent impact. The two impacts are therefore not necessarily additive. The majority of species for which disturbance impacts have been considered as part of the assessments conducted for the Transmission Assets (**section 5.11.2**) are not vulnerable to disturbance impacts (**Table 5.21**) and therefore the magnitude of impact is considered to be negligible when considering all projects that may contribute to a cumulative impact. Red-throated diver and common scoter have a Very High vulnerability to disturbance associated with vessel movements and displacement associated with structures. There are however, only a limited number of projects that may act cumulatively to materially impact important areas for both of these species. This includes the : - Mona Offshore Wind Project (Transmission Assets) - Burbo Bank Extension - Burbo Bank - Gwynt y Môr - Awel y Môr These projects are located in or within close proximity to the Liverpool Bay SPA. Other Tier 1 projects identified in Table 5.35 are located beyond the key areas for the two species within the SPA (i.e. areas commensurate with		features (this includes common scoter, red-throated diver, red-breasted merganser and cormorant). Therefore, the cumulative magnitude of all projects considered within Scenario 4c will be the same as concluded for Scenario 4a. The Isle of Man to UK Interconnector 2 may begin construction during the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets construction phases. There is currently very limited information available on this project however it is understood that the project is likely to commence construction from 2030 (Manx Utilities, 2023). The cumulative effect is predicted to be of regional spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	the original SPA designation) and are therefore not considered to contribute to any cumulative impact. The most recent assessments undertaken for red-throated diver as a feature of the Liverpool Bay SPA were included as part of the assessments conducted for the Awel y Môr offshore wind farm. The Secretary of State concluded that, an adverse effect could be excluded. No objections were raised in relation to the Awel y Môr applicant's conclusion of no adverse effect on the common scoter feature of the SPA. It is worth noting that the cumulative and in-combination assessments presented for the Awel y Môr Offshore Wind Farm incorporated a number of projects that will soon be decommissioned and therefore the cumulative impact will therefore decrease. Although these assessment were conducted on a HRA basis they are considered equally applicable to the cumulative assessments being conducted for the Transmission Assets. The area affected by the Transmission Assets within which red-throated diver and common scoter may be disturbed is 76.97 km^2. Activities within this area will be temporary and intermittent and it is anticipated that any impact is highly reversible with birds able to return to affected areas rapidly after the cessation of activities. There are predicted to be 286 vessel movements associated with the Transmission Assets during the construction phase representing a 3.0% increase on current levels of vessel traffic. This magnitude		

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	of increase is not considered to represent a material increase in the existing cumulative effect on either common scoter or red-throated diver in the region. The cumulative assessment undertaken for the Awel y Môr offshore wind farm concluded that the magnitude of cumulative impacts would be negligible with this conclusion considered equally applicable here as the contribution from the Transmission Assets is negligible in nature. The cumulative effect is predicted to be of regional spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.		
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Operation and maintenance phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**.		

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	The sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure are consistent with the sensitivities defined for the project alone assessment (**Table 5.21**). Offshore ornithological receptors are deemed to be of Very High to Very Low vulnerability, High to Medium recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be Very High to Low.		
Magnitude of impact	The CEA for Scenario 4a includes the Transmission Assets and Generation Assets (Scenario 3) and the Tier 1 projects identified in **Table 5.35**. The operation and maintenance phase of the Transmission Assets will overlap with the operation and maintenance phase of all Tier 1 projects. The assessments undertaken for other offshore ornithological receptors in the operation and maintenance phase of offshore wind farm projects focus on the impact of displacement. Displacement is a permanent impact, persisting throughout the lifetime of a project, whereas disturbance, such as that associated with the operations and maintenance phase of the Transmission Assets is a temporary, intermittent impact. In the operation and maintenance phase, disturbance may be caused by vessel movements associated with maintenance activities. As discussed in **section 5.11.2**, the predicted increase in vessel movements associated with the Transmission Assets represents only a 0.4% increase in current shipping levels in the region. This is not considered to be a material increase in current shipping levels and therefore the contribution of the Transmission Assets to the existing cumulative impact is negligible.	As no Tier 2 projects have been identified as contributing to a cumulative impact alongside the Transmission Assets and those projects considered in Scenario 4a, the conclusions reached in Scenario 4a are also applicable to Scenario 4b. The cumulative effect is predicted to be of regional spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	In addition to those projects considered as part of Scenario 4b, Scenario 4c also considers impacts associated with the following Tier 3 projects: • MaresConnect – Wales to Ireland Interconnector cable • Isle of Man – UK Interconnector 2; and • Mooir Vannin UK Transmission Assets. The MaresConnect cable project will commence in 2025 and consists of a subsea and underground electricity interconnector system linking the existing electricity grids in Ireland and Great Britain. The operation and maintenance and decommissioning phases of this project will temporally overlap with the construction and operation and maintenance phases of the Transmission Assets. The MaresConnect Interconnector Supporting Information for Screening for Appropriate Assessments (MaresConnect, 2023) ruled out any pathways to any effects of the Liverpool Bay/Bae Lerpwl SPA and/or it's qualifying features (this includes common scoter, red-throated diver, red-breasted merganser and cormorant). Therefore, the cumulative magnitude of all projects considered within Scenario 4c will be the same as concluded for Scenario 4a.

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	As the impact from the Transmission Assets in the operation and maintenance phase is lower than that predicted in the construction phase it is considered that the conclusions reached for the construction phase are applicable here. The cumulative effect is predicted to be of regional spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.		The Isle of Man to UK Interconnector 2 will be operational during the Transmission Assets operational phase. There is currently very limited information available on this project however it is understood that the project is likely to commence construction before 2030 (Manx Utilities, 2023). The Mooir Vannin – UK Transmission Assets are likely to be constructed and become operational in the operation and maintenance phase of the Transmission Assets. Based on current information the Mooir Vannin – UK Transmission Assets is likely to comprise multiple HVAC or HVDC cables, with a grid connection at Penwortham, and could potentially include a booster station if HVAC cables are utilised (Mooir Vannin Offshore Wind Farm Limited, 2024). There is the potential for both the Mooir Vannin – UK Transmission Assets and the Isle of Man to UK Interconnector 2 to overlap with the Liverpool Bay SPA and result in disturbance to the designated features during maintenance activities. However, the is currently no information available regarding the cable route or corridor and therefore this cannot be accounted for in the cumulative assessment. The cumulative effect is predicted to be of regional spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Decommissioning phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure are consistent with the sensitivities defined for the project alone assessment (**Table 5.21**). Offshore ornithological receptors are deemed to be of Very High to Very Low vulnerability, High to Medium recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be Very High to Low.		
Magnitude of impact	The CEA for Scenario 4a includes the Transmission Assets and Generation Assets (Scenario 3) and the Tier 1 projects identified in **Table 5.35**. The impact magnitude is considered to be to the same as that estimated in the construction section. The magnitude is therefore negligible for all receptors. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the	As no Tier 2 projects have been identified as contributing to a cumulative impact alongside the Transmission Assets and those projects considered in Scenario 4a, the conclusions reached in Scenario 4a are also applicable to Scenario 4b. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	In addition to those projects considered as part of Scenario 4b, Scenario 4c also considers impacts associated with the following Tier 3 projects: • MaresConnect – Wales to Ireland Interconnector cable. • Mooir Vannin – UK Transmission Assets The MaresConnect cable project will commence in 2025 and consists of a subsea and underground electricity interconnector system linking the existing electricity grids in

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	receptor directly. The magnitude is therefore, considered to be negligible.		Ireland and Great Britain. The operation and maintenance and decommissioning phases of this project will temporally overlap with the construction and operation and maintenance phases of the Transmission Assets. The MaresConnect Interconnector Supporting Information for Screening for Appropriate Assessments (MaresConnect, 2023) ruled out any pathways to any effects of the Liverpool Bay/Bae Lerpwl SPA and/or it's qualifying features (this includes common scoter, red-throated diver, red-breasted merganser and cormorant). Therefore, the cumulative magnitude of all projects considered within Scenario 4c will be the same as concluded for Scenario 4a. During the decommissioning phase of the Transmission Assets the Mooir Vannin – UK Transmission Assets are likely to be in their operation and maintenance phase. The activities involved in this phase of the project are likely to involve the repair and reburial of cable as well as any structural maintenance to the booster station resulting in disturbance at a similar magnitude to the Transmission Assets. There is the potential for the Mooir Vannin – UK Transmission Assets to overlap with the Liverpool Bay SPA and result in disturbance to the designated features during maintenance activities. However, the is currently no information available regarding the cable route or corridor and therefore this

	Scenario 4a: Scenario 3 (Transmission Assets and Generation Assets) + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
			cannot be accounted for in the cumulative assessment. The cumulative effect is predicted to be of local spatial extent, medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be Very High to Low. The cumulative effect will, therefore, be of **minor or negligible adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species

5.13.3 Indirect impacts from underwater sound, habitat loss and increased SSCs affecting prey species.

Table 5.39: Indirect impacts from underwater sound on prey species cumulative assessment scenarios for each phase for Scenarios 1, 2 and 3

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
Construction phase			
Sensitivity of receptor	Offshore ornithological receptors are deemed to be of low to high vulnerability, low to high recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.28** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets determined that for benthic prey species, fish and shellfish the construction impacts from underwater sound on prey species will be minor. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morecambe Offshore Windfarm: Generation Assets and therefore the cumulative impact magnitude for all species remains as predicted in **section 5.11.3** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	Assessments undertaken for the Morgan Offshore Wind Project: Generation Assets in relation to indirect impacts from underwater sound affecting prey species considered impacts on guillemot, razorbill and puffin only. There was considered to be no impact pathways for other species and therefore the Morgan Offshore Wind Project: Generation Assets will not contribute to any cumulative impact with the Transmission Assets. The cumulative impact magnitude for all species remains as predicted in **section 5.11.3** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	The Morecambe Offshore Windfarm: Generation Assets determined that for benthic prey species, fish and shellfish the construction impacts from underwater sound on prey species will be minor. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morecambe Offshore Windfarm: Generation Assets and therefore the cumulative impact magnitude for all species remains as predicted in **section 5.11.3** for the Transmission Assets alone. Assessments undertaken for the Morgan Offshore Wind Project: Generation Assets in relation to indirect impacts from underwater sound affecting prey species considered impacts on guillemot, razorbill and puffin only. There was considered to be no impact pathways for other species and therefore the Morgan Offshore Wind Project: Generation

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
			Assets will not contribute to any cumulative impact with the Transmission Assets. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Operation and maintenance phase			
Sensitivity of receptor	Offshore ornithological receptors are deemed to be of low to high vulnerability, low to high recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.28** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets determined that for benthic prey species, fish and shellfish the construction impacts from underwater sound on prey species will be negligible.	There was considered to be no impact pathway in relation to indirect effects from underwater sound on prey species in the operations and maintenance phase of the Morgan Offshore Wind Project: Generation	There was considered to be no impact pathway in relation to indirect effects from underwater sound on prey species in the operations and maintenance phase of the Morgan Offshore Wind Project: Generation Assets. The impact associated with the

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	Assets. The conclusions reached for the Transmission Assets alone remain applicable. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	Morecambe Offshore Windfarm: Generation Assets is therefore the only impact that requires consideration cumulatively. The conclusion associated with Scenario 1 is therefore applicable here. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Decommissioning phase			
Sensitivity of receptor	Offshore ornithological receptors are deemed to be of low to high vulnerability, low to high recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.28** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets ES determined that any effects generated during the decommissioning phase of the project would	Decommissioning activities associated with the Morgan Offshore Wind Project: Generation Assets and the Transmission Assets are equal to or less than those carried out during the	The assessments undertaken for all three projects in relation to indirect impacts from underwater sound on prey species determined that any effects generated during the

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	be similar, or of a reduced magnitude, to those generated during the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	construction phase. The conclusions reached for the construction phase are therefore considered applicable to the decommissioning phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	decommissioning phase of the project would be similar, or of a reduced magnitude, to those generated during the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species

Table 5.40: Indirect impacts from underwater sound on prey species cumulative assessment scenarios for each phase for Scenarios 4a, 4b and 4c

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
Construction phase			
Sensitivity of receptor	Offshore ornithological receptors are deemed to be of low to high vulnerability, low to high recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.28** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The cumulative effects assessment for Scenario 4a considers the Transmission Assets and Generation Assets (Scenario 3) and the Tier 1 plans and projects identified in **Table 5.35**. Impacts associated with the plans and projects identified in **Table 5.35** that may affect ornithological receptors are: • Temporary habitat loss/disturbance from all project phases. • Underwater sound impacting fish and shellfish receptors in all project phases. • Increased SSCs and associated sediment deposition during all project phases. • Long term habitat loss during all project phases. • Disturbance/remobilisation of sediment-bound contaminants during all project phases. These impacts may result from vessel movements, cable repair and reburial or operations and maintenance activities.	No additional projects have been identified in Tier 2 and therefore the conclusion reached for Scenario 4a are considered applicable to Scenario 4b. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	In addition to those projects considered as part of Scenario 4b, Scenario 4c also considers impacts associated with the following Tier 3 projects: • the MaresConnect – Wales to Ireland Interconnector cable; and • Isle of Man Interconnector Cable 2 The MaresConnect cable project will commence in 2025 and consists of a subsea and underground electricity interconnector system linking the existing electricity grids in Ireland and Great Britain. The operation and maintenance and decommissioning phases of this project will temporally overlap with the construction and operation and maintenance phases of the Transmission Assets. The MaresConnect Interconnector Supporting Information for Screening for Appropriate Assessments (MaresConnect, 2023) ruled out any pathways to any effects of the Liverpool Bay/Bae Lerpwl SPA and/or it's qualifying features (this includes common scoter, red-throated diver, red-breasted merganser and cormorant). Therefore, the cumulative magnitude of all projects considered within

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	The spatial scale of activities associated with all projects identified in Tier 1 are limited representing negligible proportions of the area available for all receptors for foraging, roosting and other maintenance behaviours. The majority of offshore renewables projects that may overlap temporally with the Transmission Assets are in the operations phase where activities that may cause indirect impacts on prey species are reduced, when compared to the construction or decommissioning phases. Any activities that may result in impacts are limited in number, intermittent and will occur over short time periods and are highly unlikely to be significant for any offshore ornithological receptor. The construction phases of the Mona Offshore Wind Project, Awel y Môr Offshore Wind Farm will overlap with the construction phase of the Transmission Assets. Assessments undertaken for the Mona Offshore Wind Project in relation to indirect impacts from underwater sound affecting prey species considered impacts on guillemot, razorbill and puffin only. There was considered to be no impact pathways for other species and therefore the Mona Offshore Wind Project will not contribute to any cumulative impact with the Transmission Assets. The assessments undertaken for the Awel y Môr offshore wind farm also concluded that any impacts would be temporary, short-term and small in extent with no significant effects predicted for potential prey species. The		Scenario 4c will be the same as concluded for Scenario 4a. The Isle of Man to UK Interconnector 2 may be under construction during the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets construction phases. There is currently very limited information available on this project however it is understood that the project is likely to commence construction from 2030 (Manx Utilities, 2023). The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	assessments concluded that there was no potential for any indirect effects of an adverse significance to occur. The timeframes associated with the West Anglesey Demonstration Zone tidal site, Project Erebus – Floating Offshore Wind Project, White Cross and Twinhub offshore renewable projects are unknown however, it is possible that the construction phases of these projects may overlap with the construction phase of the Transmission Assets. All of these projects are smaller in scale when compared to the Mona Offshore Wind Project and Awel y Môr Offshore Wind Farm projects with the three offshore wind projects located a considerable distance from the Transmission Assets. The magnitude of any impacts are therefore smaller. Due to the length of the Isle of Man to UK Interconnector Cable and the relatively small area of overlap with the Transmission Assets, it is considered that the Interconnector Cable maintenance and remedial works are unlikely to overlap spatially and/or temporally with Transmission Assets during construction, operations and maintenance and/or decommissioning activities. In addition, both activities are short-term, localised and temporary in nature and any overlap would still only lead to minor adverse effects which are not significant in EIA terms. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is		

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.		
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Operation and maintenance phase			
Sensitivity of receptor	Offshore ornithological receptors are deemed to be of low to high vulnerability, low to high recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.28** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The CEA for Scenario 4a includes the Transmission Assets and Generation Assets (Scenario 3) and the Tier 1 projects identified in **Table 5.35**. The impacts associated with many of the projects identified in Tier 1 will remain constant through the operations and maintenance phase of the Transmission Assets. For those projects where the construction phase overlaps with the construction phase of the Transmission Assets (as assessed above in Scenario 3), the project will progress into the operations and maintenance phase where it is expected that the magnitude of any impact will be	No additional projects have been identified in Tier 2 and therefore the conclusion reached for Scenario 4a are considered applicable to Scenario 4b. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	The impact associated with the MaresConnect, the Isle of Man – UK Interconnector 2 and Mooir Vannin UK Transmission Assets project will be the same as considered as part of the assessments undertaken for the Transmission Assets in the construction phase. The impact magnitude associated with the Transmission Assets is considered to be m*uch* lower than assessed in the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	lower due to decreased activity within and around the project. It is therefore considered that for all projects in Tier 1 the impact will either be equal to or less than the impact predicted to occur during the construction phase of the Transmission Assets. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.		
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species
Decommissioning phase			
Sensitivity of receptor	Offshore ornithological receptors are deemed to be of low to high vulnerability, low to high recoverability and International to Local value. The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.28** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The CEA for Scenario 4a includes the Transmission Assets and Generation Assets (Scenario 3) and the Tier 1 projects identified in **Table 5.35**.	No additional projects have been identified in Tier 2 and therefore the conclusion reached for Scenario 4a are considered applicable to Scenario 4b.	Consistent with the assessments undertaken for the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets, the magnitude of impacts associated

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	Consistent with the assessments undertaken for the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets, the magnitude of impacts associated with projects considered cumulatively will be similar, or of a reduced magnitude, to those generated during the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	with projects considered cumulatively will be similar, or of a reduced magnitude, to those generated during the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species	No mitigation measures are considered necessary in relation to indirect impacts from underwater sound affecting prey species

5.13.4 Temporary habitat loss/disturbance and increased SSCs.

Table 5.41: Temporary habitat loss/disturbance and increased SSCs cumulative assessment scenarios for each phase for Scenarios 1, 2 and 3

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
Construction phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to temporary habitat loss/disturbance and increased SSCs are consistent with the sensitivities defined for the project alone assessment (**Table 5.33**). The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.33** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets determined that for benthic prey species, fish and shellfish the construction impacts from temporary habitat loss/disturbance and increased SSCs will be minor. It was therefore concluded that the impact on seabird species (including red-throated diver and common scoter) would be of minor adverse significance. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morecambe Offshore Windfarm: Generation Assets and therefore the cumulative impact magnitude for all	Assessments undertaken for the Morgan Offshore Wind Project: Generation Assets in relation to temporary habitat loss/disturbance and increased SSCs considered impacts on guillemot, razorbill and puffin only. There was considered to be no impact pathways for other species and therefore the Morgan Offshore Wind Project: Generation Assets will not contribute to any cumulative impact with the Transmission Assets. The inclusion of impacts associated with the Morgan Offshore Wind Project: Generation Assets are therefore not considered to materially alter the conclusions reached for the Transmission Assets alone for species considered to be vulnerable to temporary habitat loss/disturbance and increased SSCs.	The Morecambe Offshore Windfarm: Generation Assets determined that the impact on ornithological receptors due to temporary habitat loss/disturbance and increased SSCs will be minor. Cormorant, eider, red-breasted merganser and scaup were not considered key receptors in relation to disturbance impacts as part of the assessments for the Morecambe Offshore Windfarm: Generation Assets and therefore the cumulative impact magnitude for all species remains as predicted in **section 5.11.3** for the Transmission Assets alone. Assessments undertaken for the Morgan Offshore Wind Project: Generation Assets in relation to temporary habitat loss/disturbance

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	species remains as predicted in **section 5.11.3** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	The cumulative impact magnitude for all species remains as predicted in **section 5.11.4** for the Transmission Assets alone. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	and increased SSCs considered impacts on guillemot, razorbill and puffin only. There was considered to be no impact pathways for other species and therefore the Morgan Offshore Wind Project: Generation Assets will not contribute to any cumulative impact with the Transmission Assets. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.
Operations and maintenance phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to temporary habitat loss/disturbance and increased SSCs are consistent with the sensitivities defined for the project alone assessment (**Table 5.33**).		

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.33** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets ES determined that any indirect effects on seabirds as a result of operations and maintenance impacts on habitats and prey would be of negligible or minor adverse significance. The effect on seabirds as a result of temporary habitat loss/disturbance and increased SSCs during the operations and maintenance of the Transmission Assets is considered to be of negligible or minor adverse significance. Due to the short-term, localised and temporary nature of the construction works, the cumulative effect will, therefore, be of minor adverse significance, which is not significant.	Operations and maintenance activities associated with the Morgan Offshore Wind Project: Generation Assets and the Transmission Assets are anticipated to be of a lower magnitude than those carried out during the construction phase. Assessments undertaken for the Morgan Offshore Wind Project: Generation Assets in relation to temporary habitat loss/disturbance and increased SSCs considered impacts on guillemot, razorbill and puffin only. There was considered to be no impact pathways for other species and therefore the Morgan Offshore Wind Project: Generation Assets will not contribute to any cumulative impact with the Transmission Assets. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	The assessments undertaken for all three projects in relation temporary habitat loss/disturbance and increased SSCs determined that any effects generated during the operations and maintenance phase of the project would be of a reduced magnitude to those generated during the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.
Decommissioning phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to temporary habitat loss/disturbance and increased SSCs are consistent with the sensitivities defined for the project alone assessment (**Table 5.33**). The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.33** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The Morecambe Offshore Windfarm: Generation Assets ES determined that any effects generated during the decommissioning phase of the project would be similar, or of a reduced magnitude, to those generated during the construction phase. The indirect effects on seabirds as a result of decommissioning impacts on habitats and prey would be of negligible or minor adverse significance. The effect on seabirds as a result of temporary habitat loss/disturbance and increased SSCs during the decommissioning of the Transmission Assets is considered to be of negligible or minor adverse significance. Due to the short-term, localised and temporary nature of the construction works, the cumulative effect will, therefore, be of	Decommissioning activities associated with the Morgan Offshore Wind Project: Generation Assets and the Transmission Assets are equal to or less than those carried out during the construction phase. The conclusions reached for the construction phase are therefore considered applicable to the decommissioning phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	The assessments undertaken for all three projects in relation temporary habitat loss/disturbance and increased SSCs determined that any effects generated during the decommissioning phase of the project would be similar, or of a reduced magnitude, to those generated during the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets + Morgan Offshore Wind Project: Generation Assets
	minor adverse significance, which is not significant.		
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.

Table 5.42: Temporary habitat loss/disturbance and increased SSCs cumulative assessment scenarios for each phase for Scenarios 4a, 4b and 4c

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
Construction phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to temporary habitat loss/disturbance and increased SSCs are consistent with the sensitivities defined for the project alone assessment (**Table 5.33**). The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.33** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
Magnitude of impact	The cumulative effects assessment for Scenario 4a considers the Transmission Assets and Generation Assets (Scenario 3) and Tier 1 plans and projects identified in **Table 5.35**. Impacts associated with the plans and projects identified in **Table 5.35** that may affect ornithological receptors are: • temporary habitat loss and disturbance from installation and maintenance operations; and • disturbance/remobilisation of sediment-bound contaminants during installation and maintenance activities. The spatial scale of activities associated with all projects identified in Tier 1 are limited representing negligible proportions of the area available for all receptors for foraging, roosting and other maintenance behaviours. The majority of offshore renewables projects that may overlap temporally with the Transmission Assets are in the operations phase where activities that may cause temporary habitat loss/disturbance and increased SSCs are reduced, when compared to the construction or decommissioning phases. Any activities that may result in impacts are limited in number, intermittent and will occur over short time periods and are highly unlikely to be significant for any offshore ornithological receptor. The construction phases of the Mona Offshore Wind Project, Awel y Môr Offshore Wind Farm will overlap with the construction phase of the	No additional projects have been identified in Tier 2 and therefore the conclusion reached for Scenario 4a are considered applicable to Scenario 4b. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	In addition to those projects considered as part of Scenario 4b, Scenario 4c also considers impacts associated with the following Tier 3 projects: • the MaresConnect – Wales to Ireland Interconnector cable; and • Isle of Man Interconnector Cable 2 The MaresConnect cable project will commence in 2025 and consists of a subsea and underground electricity interconnector system linking the existing electricity grids in Ireland and Great Britain. The operation and maintenance and decommissioning phases of this project will temporally overlap with the construction and operation and maintenance phases of the Transmission Assets. The MaresConnect Interconnector Supporting Information for Screening for Appropriate Assessments (MaresConnect, 2023) ruled out any pathways to any effects of the Liverpool Bay/Bae Lerpwl SPA and/or it's qualifying features (this includes common scoter, red-throated diver, red-breasted merganser and cormorant). Therefore, the cumulative magnitude of all projects considered within Scenario 4c will be the same as concluded for Scenario 4a. The Isle of Man to UK Interconnector 2 may be under construction during the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets construction phases. There is currently very limited information available on this project however it is understood that the project is

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	Transmission Assets. Assessments undertaken for the Mona Offshore Wind Project concluded that the impact magnitude would be of local spatial extent, short-duration, intermittent and reversible. It was predicted that the impact would affect the receptor indirectly. The magnitude was therefore, considered to be low for all receptors and the impact significance minor. The assessments undertaken for the Awel y Môr offshore wind farm also concluded that any impacts would be temporary, short-term and small in extent. The assessments concluded that there was no potential for any indirect effects of an adverse significance to occur. The timeframes associated with the West Anglesey Demonstration Zone tidal site, Project Erebus – Floating Offshore Wind Project, White Cross and Twinhub offshore renewable projects are unknown however, it is possible that the construction phases of these projects may overlap with the construction phase of the Transmission Assets. All of these projects are smaller in scale when compared to the Mona Offshore Wind Project and Awel y Môr Offshore Wind Farm projects with the three offshore wind projects located a considerable distance from the Transmission Assets. The magnitude of any impacts are therefore smaller. Due to the length of the Isle of Man to UK Interconnector Cable and the relatively small area of overlap with the Transmission Assets, it is considered that the Interconnector Cable maintenance and remedial works are unlikely		likely to commence construction from 2030 (Manx Utilities, 2023). The cumulative effect of this scenario is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	to overlap spatially and/or temporally with Transmission Assets during construction, operations and maintenance and/or decommissioning activities. In addition, both activities are short-term, localised and temporary in nature and any overlap would still only lead to minor adverse effects which are not significant in EIA terms. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.		
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.
Operations and maintenance phase			
Sensitivity of receptor	The cumulative effects assessment for Scenario 4a considers the Transmission Assets and Generation Assets (Scenario 3) and Tier 1 plans and projects identified in **Table 5.35**.	No additional projects have been identified in Tier 2 and therefore the conclusion reached for Scenario 4a are considered applicable to Scenario 4b. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the	In addition to those projects considered as part of Scenario 4b, Scenario 4c also considers impacts associated with the following Tier 3 projects: • MaresConnect – Wales to Ireland Interconnector cable • Isle of Man – UK Interconnector 2; and

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	Impacts associated with the plans and projects identified in **Table 5.35** that may affect ornithological receptors are: • temporary habitat loss and disturbance from installation and maintenance operations; and • disturbance/remobilisation of sediment-bound contaminants during installation and maintenance activities. The spatial scale of activities associated with all projects identified in Tier 1 are limited representing negligible proportions of the area available for all receptors for foraging, roosting and other maintenance behaviours. The majority of offshore renewables projects that may overlap temporally with the Transmission Assets are in the operations phase where activities that may cause temporary habitat loss/disturbance and increased SSCs are reduced, when compared to the construction or decommissioning phases. Any activities that may result in impacts are limited in number, intermittent and will occur over short time periods and are highly unlikely to be significant for any offshore ornithological receptor. Assessments undertaken for the Mona Offshore Wind Project concluded that the impact magnitude would be of local spatial extent, short-duration, intermittent and reversible. It was predicted that the impact would affect the receptor indirectly. The magnitude was therefore, considered to be low for all receptors and the impact significance minor.	receptor indirectly. The magnitude is therefore, considered to be negligible.	• Mooir Vannin UK Transmission Assets. The MaresConnect cable project will commence in 2025 and consists of a subsea and underground electricity interconnector system linking the existing electricity grids in Ireland and Great Britain. The operation and maintenance and decommissioning phases of this project will temporally overlap with the operation and maintenance phases of the Transmission Assets. The MaresConnect Interconnector Supporting Information for Screening for Appropriate Assessments (MaresConnect, 2023) ruled out any pathways to any effects of the Liverpool Bay/Bae Lerpwl SPA and/or it's qualifying features (this includes common scoter, red-throated diver, red-breasted merganser and cormorant). Therefore, the cumulative magnitude of all projects considered within Scenario 4c will be the same as concluded for Scenario 4a. The Isle of Man to UK Interconnector 2 will be operational during the Transmission Assets operational phase. There is currently very limited information available on this project however it is understood that the project is likely to commence construction before 2030 (Manx Utilities, 2023). The Mooir Vannin – UK Transmission Assets are likely to be constructed and become operational in the operation and maintenance phase of the Transmission Assets. Based on current information the Mooir Vannin – UK Transmission Assets is likely to comprise multiple HVAC or HVDC cables, with a grid

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	The assessments undertaken for the Awel y Môr offshore wind farm also concluded that any impacts would be temporary, short-term and small in extent. The assessments concluded that there was no potential for any indirect effects of an adverse significance to occur. The timeframes associated with the West Anglesey Demonstration Zone tidal site, Project Erebus – Floating Offshore Wind Project, White Cross and Twinhub offshore renewable projects are unknown however, it is possible that the operations and maintenance phases of these projects may overlap with the operations and maintenance phase of the Transmission Assets. All of these projects are smaller in scale when compared to the Mona Offshore Wind Project and Awel y Môr Offshore Wind Farm projects with the three offshore wind projects located a considerable distance from the Transmission Assets. The magnitude of any impacts are therefore smaller. Due to the length of the Isle of Man to UK Interconnector Cable and the relatively small area of overlap with the Transmission Assets, it is considered that the Interconnector Cable maintenance and remedial works are unlikely to overlap spatially and/or temporally with Transmission Assets during construction, operations and maintenance and/or decommissioning activities. In addition, both activities are short-term, localised and temporary in nature and any overlap would still only lead to minor adverse effects which are not significant in EIA terms.		connection at Penwortham, and could potentially include a booster station if HVAC cables are utilised (Mooir Vannin Offshore Wind Farm Limited, 2024). There is the potential for both the Mooir Vannin – UK Transmission Assets and the Isle of Man to UK Interconnector 2 to overlap with the Liverpool Bay SPA and result in disturbance to the designated features during maintenance activities. However, the is currently no information available regarding the cable route or corridor and therefore this cannot be accounted for in the cumulative assessment. The cumulative effect from this scenario is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.		
Magnitude of impact	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Significance of effect	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.
Decommissioning phase			
Sensitivity of receptor	The sensitivity of all receptors is defined based on the conservation value, impact vulnerability and recoverability. This information for each receptor is presented in **Table 5.11** and **Table 5.12** with the definitions used to integrate this information to determine sensitivity for each receptor presented in **Table 5.18**. The sensitivity of all receptors to temporary habitat loss/disturbance and increased SSCs are consistent with the sensitivities defined for the project alone assessment (**Table 5.33**). The sensitivity of the receptor is therefore, considered to be high or negligible. Please see **Table 5.33** for a breakdown of the different elements that contribute to the determination of sensitivity, along with the sensitivity for each receptor.		
Magnitude of impact	The CEA for Scenario 4a includes the Transmission Assets and Generation Assets (Scenario 3) and the Tier 1 projects identified in **Table 5.35**. Consistent with the assessments undertaken for the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets, the magnitude of impacts associated	No additional projects have been identified in Tier 2 and therefore the conclusion reached for Scenario 4a are considered applicable to Scenario 4b. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the	Consistent with the assessments undertaken for the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets, the magnitude of impacts associated with projects considered cumulatively in this scenario will be similar, or of a reduced magnitude, to those generated during the construction phase.

	Scenario 4a: Scenario 3 + Tier 1	Scenario 4b: Scenario 3 + Tier 1 and 2	Scenario 4c: Scenario 3 + Tier 1, 2 and 3
	with projects considered cumulatively will be similar, or of a reduced magnitude, to those generated during the construction phase. The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	receptor indirectly. The magnitude is therefore, considered to be negligible.	The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high or negligible. The cumulative effect will, therefore, be of **negligible or minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.	No mitigation measures are considered necessary in relation to temporary habitat loss/disturbance and increased SSCs.

5.13.5 Future monitoring

5.13.5.1 Based upon the results of the assessment, no monitoring to test the predictions made within the impact assessment is considered necessary as no potentially significant effects to offshore ornithology receptors are predicted.

5.14 Transboundary effects

5.14.1.1 A screening of transboundary impacts has been carried out (see Volume 1, Annex 5.4: Transboundary screening of the ES). Given the negligible to minor significance of predicted effects during all stages of the Transmission Assets and the limited geographical and temporal scope of such effects, this screening has identified that there is no potential for significant transboundary effects with regard to offshore ornithology from the Transmission Assets upon the interests of other states.

5.14.1.2 It should be noted that the Isle of Man is not considered to be transboundary in this ES and has been included in the main assessment.

5.15 Inter-related effects

5.15.1.1 Inter-relationships are the impacts and associated effects of different aspects of the Transmission Assets on the same receptor, these are as follows.

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Transmission Assets (construction, operations and maintenance and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation (e.g., construction sound effects from piling, operational substation sound and decommissioning disturbance).
- Receptor led effects: Assessment of the scope for all relevant effects across multiple topics (including inter-relationships between environmental topics) to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on offshore ornithology (i.e., disturbance and/or displacement from airborne sound, underwater sound and presence of vessels and infrastructure, indirect impacts from underwater sound affecting prey species and temporary habitat loss/disturbance and increased SSCs), may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

5.15.1.2 A description of the likely interactive effects arising from the Transmission Assets on offshore ornithology is provided in Volume 4, Chapter 5: Inter-relationships of the ES. There is no change in the significance of effects resulting from the inter-related assessment for offshore ornithology.

5.16 Summary of impacts, mitigation measures and monitoring

5.16.1.1 Information on offshore ornithology within the study area was collected through review of available literature, other offshore wind farm assessments, UK statutory guidance, analysis of the data collected during the Generation Assets baseline characterisation surveys and consultation with relevant stakeholders.

5.16.1.2 **Table** 5.43 below presents a summary of the potential impacts, measures adopted as part of the Transmission Assets and residual effects in respect to offshore ornithology. The impacts assessed include: disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure, indirect impacts from underwater sound affecting prey species, temporary habitat loss/disturbance and increased SSCs. Overall, it is concluded that there will be no likely significant effects arising from the Transmission Assets during the construction, operations and maintenance, or decommissioning phases.

5.16.1.3 **Table 5.44** below presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed include: disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure, indirect impacts from underwater sound affecting prey species, temporary habitat loss/disturbance and increased SSCs. Overall, it is concluded that there will be no likely significant cumulative effects from the Transmission Assets alongside other projects/plans.

5.16.1.4 No potential transboundary impacts have been identified in regard to effects of the Transmission Assets.

Table 5.43: Summary of environmental effects, mitigation and monitoring

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D							
Disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure	✓	✓	✓	CoT69, CoT110, CoT111	All receptors: C: Negligible O: Negligible D: Negligible	All phases: Black-headed gull: Negligible Common gull: Negligible Common scoter: Very High Cormorant: High Eider: High Fulmar: Negligible Gannet: Negligible Great black-backed gull: Negligible Guillemot Low Herring gull: Negligible Kittiwake: Negligible	All phases: Black-headed gull: Negligible Common gull: Negligible Common scoter: Minor adverse Cormorant: Minor adverse Eider Minor adverse Fulmar: Negligible Gannet: Negligible Great black-backed gull: Negligible Guillemot Negligible or minor adverse Herring gull: Negligible Kittiwake: Negligible	None proposed beyond existing commitments.	All phases: Black-headed gull: Negligible Common gull: Negligible Common scoter: Minor adverse Cormorant: Minor adverse Eider Minor adverse Fulmar: Negligible Gannet: Negligible Great black-backed gull: Negligible Guillemot Negligible or minor adverse Herring gull: Negligible Kittiwake: Negligible	None

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D							
						Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible Puffin: Medium Razorbill: Low Red-breasted merganser: Medium Red-throated diver: Very High Scaup: Medium	Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible Puffin: Negligible or minor adverse Razorbill: Negligible or minor adverse Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse		Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible Puffin: Negligible or minor adverse Razorbill: Negligible or minor adverse Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse	
Indirect impacts from underwater sound affecting prey species	✓	✓	✓	None	All receptors: C: Negligible O: Negligible D: Negligible	All phases Black-headed gull: Negligible Common gull: Negligible	All phases: Black-headed gull: Negligible Common gull: Negligible	None proposed beyond existing commitments.	All phases: Black-headed gull: Negligible Common gull: Negligible	None

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D			Common scoter: High Cormorant: Negligible Eider High Fulmar: Negligible Gannet: Negligible Great black-backed gull: Negligible Guillemot Negligible Herring gull: Negligible Kittiwake: Negligible Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible	Common scoter: Minor adverse Cormorant: Minor adverse Eider Minor adverse Fulmar: Negligible Gannet: Negligible Great black-backed gull: Negligible Guillemot Negligible Herring gull: Negligible Kittiwake: Negligible Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible Puffin: Negligible Razorbill: Negligible		Common scoter: Minor adverse Cormorant: Minor adverse Eider Minor adverse Fulmar: Negligible Gannet: Negligible Great black-backed gull: Negligible Guillemot Negligible Herring gull: Negligible Kittiwake: Negligible Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible	

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D			Puffin: Negligible Razorbill: Negligible Red-breasted merganser: High Red-throated diver: High Scaup: High	Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse		Puffin: Negligible Razorbill: Negligible Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse	
Temporary habitat loss/disturbance and increased SSCs	✓	✓	✓	CoT69, CoT110, CoT111	All receptors: C: Negligible O: Negligible D: Negligible	All phases Black-headed gull: Negligible Common gull: Negligible Common scoter: High Cormorant: Negligible Eider High Fulmar: Negligible Gannet: Negligible	All phases: Black-headed gull: Negligible Common gull: Negligible Common scoter: Minor adverse Cormorant: Minor adverse Eider Minor adverse Fulmar: Negligible Gannet: Negligible	None proposed beyond existing commitments.	All phases: Black-headed gull: Negligible Common gull: Negligible Common scoter: Minor adverse Cormorant: Minor adverse Eider Minor adverse Fulmar: Negligible	None

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D			Great black-backed gull: Negligible Guillemot Negligible Herring gull: Negligible Kittiwake: Negligible Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible Puffin: Negligible Razorbill: Negligible Red-breasted merganser: High Red-throated diver: High Scaup: High	Great black-backed gull: Negligible Guillemot Negligible Herring gull: Negligible Kittiwake: Negligible Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible Puffin: Negligible Razorbill: Negligible Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse		Gannet: Negligible Great black-backed gull: Negligible Guillemot Negligible Herring gull: Negligible Kittiwake: Negligible Lesser black-backed gull: Negligible Little gull: Negligible Manx shearwater Negligible Puffin: Negligible Razorbill: Negligible Red-breasted merganser: Minor adverse	

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D							
									Red-throated diver: Minor adverse Scaup: Minor adverse	

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 5.44: Summary of cumulative environmental effects, mitigation and monitoring.

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Disturbance and displacement from airborne sound, underwater sound and presence of vessels and infrastructure	✓	✓	✓	CoT69, CoT110, CoT111	All receptors: C: Negligible O: Negligible D: Negligible	All phases: Common scoter: Very High Cormorant: High Eider: High Red-breasted merganser: High Red-throated diver: Very High	All phases: Common scoter: Minor adverse Cormorant: Minor adverse Eider: Minor adverse Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse	None proposed beyond existing commitments.	All phases: Common scoter: Minor adverse Cormorant: Minor adverse Eider: Minor adverse Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse	None

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
						Scaup: High	Scaup: Minor adverse			
Indirect impacts from underwater sound affecting prey species	✓	✓	✓	None	All receptors: C: Negligible O: Negligible D: Negligible	All phases: Common scoter: High Red-breasted merganser: High Red-throated diver: High Scaup: High Eider: High	All phases: Common scoter: Minor adverse Eider: Minor adverse Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse	None proposed beyond existing commitments.	All phases: Common scoter: Minor adverse Eider: Minor adverse Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse	None
Temporary habitat loss/disturbance and increased SSCs	✓	×	✓	CoT69, CoT110, CoT111	All receptors: C: Negligible O: Negligible D: Negligible	All phases: Common scoter: High Red-breasted merganser: High Red-throated diver: High	All phases: Common scoter: Minor adverse Eider: Minor adverse Red-breasted merganser: Minor adverse	None proposed beyond existing commitments.	All phases: Common scoter: Minor adverse Eider: Minor adverse Red-breasted merganser: Minor adverse Red-throated diver: Minor adverse Scaup: Minor adverse	None

Description of impact	Phase[a]			Measures adopted as part of the project (Table 5.15)	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
						Scaup: High Eider: High	Red-throated diver: Minor adverse Scaup: Minor adverse			

[a] C=construction, O=operation and maintenance, D=decommissioning

5.17 References

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